WTCI-119-P

17 WTC

175

Engineering Quality Assurance Division

14

Trade Center Tower A Structure Elements

Port Authority Facility Condition Survey Program

World Trade Center Tower A Architectural Elements

August 1991

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SEP 9 1991
A. TRIVEDI

Engineering Department
THE PORT AUTHORITY OF NY & NJ

6

THE WORLD TRADE CENTER

TOWER A

RECEIVED
SEP 9 1991
A. TRIVEDI

ARCHITECTURAL ELEMENTS CONDITION SURVEY

QUALITY ASSURANCE DIVISION
ENGINEERING DEPARTMENT

R.M. MONTI,P.E., DIRECTOR OF ENGINEERING & CHIEF ENGINEER

EXECUTIVE SUMMARY

This report details the findings of the condition survey of Architectural Elements - World Trade Center Tower "A" performed by the Quality Assurance Division. The main lobby ceiling was inspected by the consulting firm of Corddry, Carpenter, Dietz and Zack in November and December 1990. A report entitled, "World Trade Center, 1 WTC and 2 WTC Main Lobby Ceilings was issued February 1991.

The architectural elements included in this report are as follows:

- Main Lobby - Marble Panels and Mezzanine Railings
- Ceilings - Tenant and Public Areas
- Stairways

At each inspection location, findings were recorded on field forms and photographs were taken. Field notes are available for use through the Quality Assurance Division.

The inspection results show that the architectural elements of Tower "A" are in good condition, although it shows signs of use and requires some minor repairs on a routine basis.

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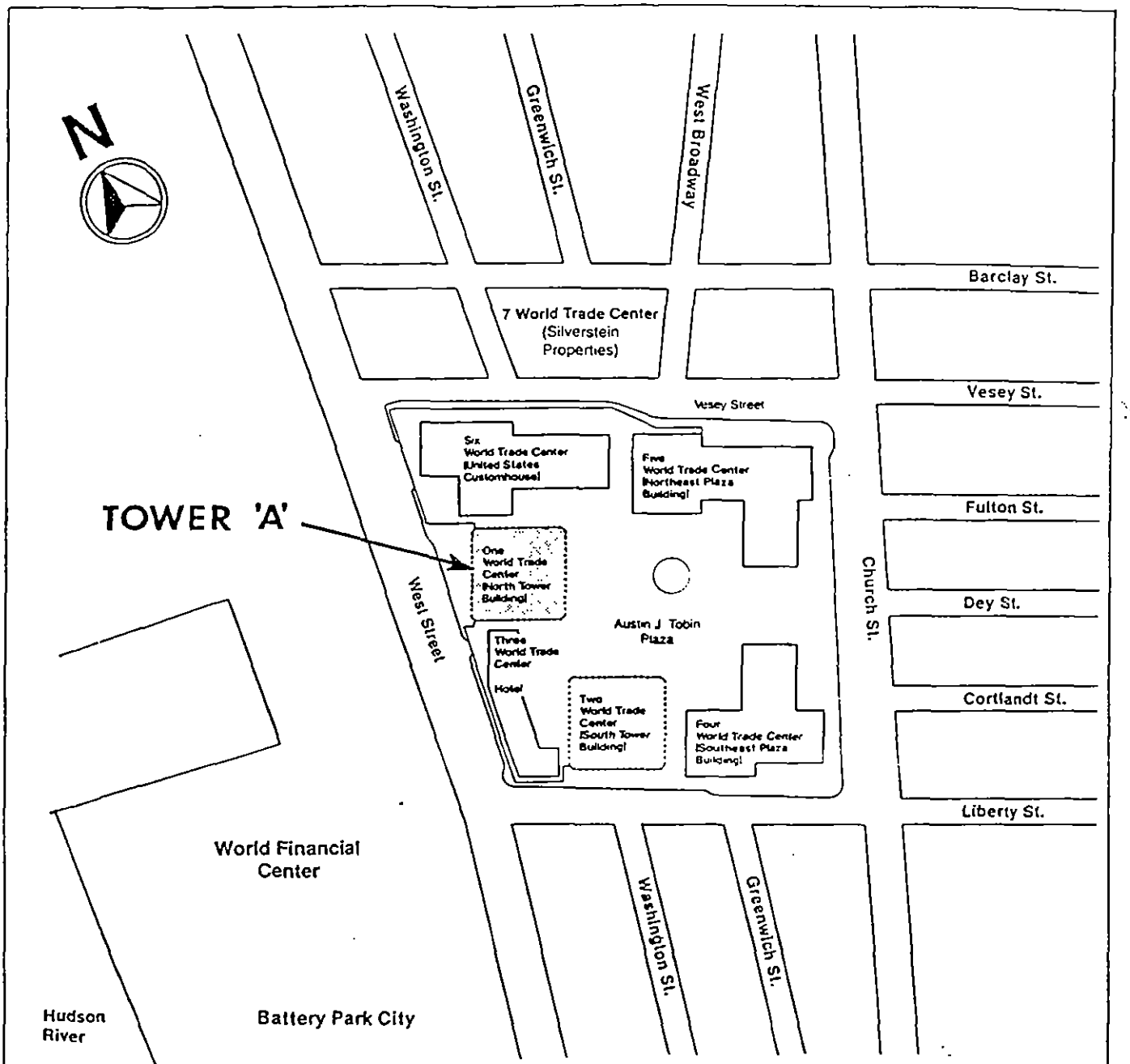
A. Main Lobby - Marble Panels & Mezzanine Railings

B. Ceilings - Tenant and Public Areas

C. Stairways



THE WORLD TRADE CENTER
TOWER "A"
CONDITION SURVEY

LOCATION PLAN

Drawing Number: 1

INDEX OF PHOTOGRAPHS

Photo No.	Description
	Main Lobby - Marble Panels and Mezzanine Railings
M1	Upper Lobby - General view
M2	East core wall - Fine cracks in marble panels
M3	West wall - Col. No. 457 Upper panel protrudes + 3/8" beyond lower panel
M4	Mezzanine railing and marble coping - general view
	Ceilings - Tenant and Public Areas
C1	44th floor sky lobby - Main Corridor plaster ceiling suspension system
C2	43rd floor P.A. Cafeteria - Plaster ceiling suspension system
	Stairways
S1	Crack along edge of platform - 1/16" + vertical displacement
S2	Underside of intermediate landing Lightspot rust and rust stains.

I. Scope of Work and Inspection Procedure

I. SCOPE OF WORK AND INSPECTION PROCEDURE

A. SCOPE OF WORK

The condition survey of the World Trade Center Tower "A" - Architectural Elements was performed by the Quality Assurance Division of the Engineering Department from March through April of 1991. The scope of work required a condition survey of the following Architectural Elements:

- Main Lobby - Marble Panels & Mezzanine Railings
- Tenant and Public Area Ceilings
- Stairways

The inspection was performed to determine the condition of the elements and to identify deficiencies, if any, which may present a potential safety hazard. Deficiencies were measured, photographed and recorded on preprinted inspection forms.

B. INSPECTION TERMINOLOGY

The following terms are used to describe the deficiencies found on the inspected elements:

Light Rust: A loose rust formation dotting the paint surface.

Cracks: Marble, concrete, plaster or gypsum board.

Fine (or Hairline): Less than 1/16" in width.
Medium: Between 1/16" and 1/8" in width.
Wide: Over 1/8" in width.

Scaling: Flaking or peeling of a concrete or mortar surface.

The following terms are used to describe the condition rating of the inspected elements:

EXCELLENT — Element is in like new condition.

GOOD — Element is sound and performing its functions, although it shows signs of use and may require some minor repairs, mostly "routine".

FAIR — Element is still performing adequately at this time but needs "priority" and/or "routine" repairs to prevent further deterioration and to restore it to good condition.

POOR — Element cannot be relied upon to continue to perform its original function without significant "immediate" and/or "priority" repairs

The following terms are used to describe the categories of the recommended repairs:

"IMMEDIATE" Requires "immediate" action including possible closing of the structure or areas affected for safety reasons until interim remedial measures, such as shoring or removal of potentially unsafe structures (or elements), can be implemented. These closings or interim remedial actions, if any, always require immediate action upon discovery.

"PRIORITY" Conditions for which no immediate action may be required, or for which immediate action has been completed, but for which further investigations design and implementation of interim or long term repairs should be undertaken on a priority basis, i.e. taking precedence over all other scheduled work.

"ROUTINE" Conditions requiring further investigation or remedial work which can be undertaken as part of a scheduled maintenance program, other scheduled project, or routine facility maintenance depending on the action required.

C. INSPECTION PROCEDURE

A visual and hands-on inspection was performed by field teams of one and two persons each. Assistance was provided by facility personnel and Turner Construction. The inspection was divided into three segments made up of the architectural elements listed below. Following is a description of the inspection procedure used for each element.

1. Main Lobby - Marble Panels and Mezzanine Railings

A visual inspection of the marble panels was performed, using binoculars, from the Plaza and Concourse floor levels. An up-close inspection, using a lift vehicle, was performed from the Plaza Level. A motorized scaffold was used on the North core wall. The entire length of the mezzanine railing was inspected up-close.

2. Tenant and Public Area Ceiling

Ceilings in tenant office areas and public areas were inspected from each floor level. Support systems for lightweight ceilings were not inspected if there was no evidence of distress in the ceiling. Access for heavyweight ceilings was gained through existing hatches, light fixtures and through adjacent tile ceilings.

3. Stairways

All three main stairways were walked from top to bottom. Stairway framing was visually examined for signs of movement, deformation and corrosion. Partition walls were examined for signs of movement.

II. Detailed Inspection Findings, Conclusions and Recommendations

II. DETAILED INSPECTION FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

A. MAIN LOBBY MARBLE PANELS AND RAILINGS

1. Description - Architectural Systems

The main lobby is an open space six stories in height, with a cantilevered mezzanine level (balcony) in the outer area of the second floor level (Plaza Level). The exterior columns and the exterior faces of the elevator shafts are finished with marble and stainless steel panels, see photograph No. M1.

A typical marble panel measures 4" - 0" wide by 8' - 0" high, and is 7/8" thick. In most cases, the marble panels have stone liners attached, which bear on shelf angles connected to the structural framing. In some cases, the panels do not bear on shelf angles but are supported by the panel below. Each panel is braced horizontally with lateral anchors, which are embedded in the gypsum wall fireboards behind the marble finish.

At the mezzanine balcony at the second floor level, a railing, constructed of stainless steel rails and posts and glass panels, is provided around the perimeter of the open space. A marble block coping (curb) is provided around the edge of the balcony floor slab.

2. Inspection Findings

The marble panels were found to be in good condition. Hairline cracks, spalled edges, and missing joint grout were observed at scattered locations throughout the lobby. No loose panels were found.

More than 2,300 marble panels, of varying size, were observed during the inspection. Approximately 300 panels (13%) had fine (hairline) cracks ranging in length from ± 2" to ± 24", see photograph No. M2. At approximately 200 locations, the lower edge of a panel was found to have protruded from 1/32" to 1/4", relative to the panel below. At one location, at the north end of the west wall, an upper panel is protruding 3/8", see photograph No. M3. This condition has been known since 1986, when at that time it was judged to be an as built condition. Detailed inspection findings for the main lobby marble panels can be found on Drawings No. SK-1 through SK-24 included in this report.

The mezzanine railing was found to be in good condition. No loose posts, rails, or glass panels were found. The marble coping at the edge of the balcony also was in good condition with no deficiencies found, see photograph No. M4.

3. Conclusions

The marble panels and mezzanine railings are in good condition.

4. Recommendations

Priority - None
Routine - Re-grout marble panel joints where required.

PHOTO M1 - UPPER LOBBY - GENERAL VIEW FROM LIFT VEHICLE.

PHOTO M2 - EAST CORE WALL - FINE CRACKS IN MARBLE PANELS

PHOTO M3 - WEST WALL - COL. 457 - UPPER PANEL PROTRUDES +3/8" BEYOND LOWER PANEL & GROUT MISSING BETWEEN PANEL AND STAINLESS STEEL FRAME.

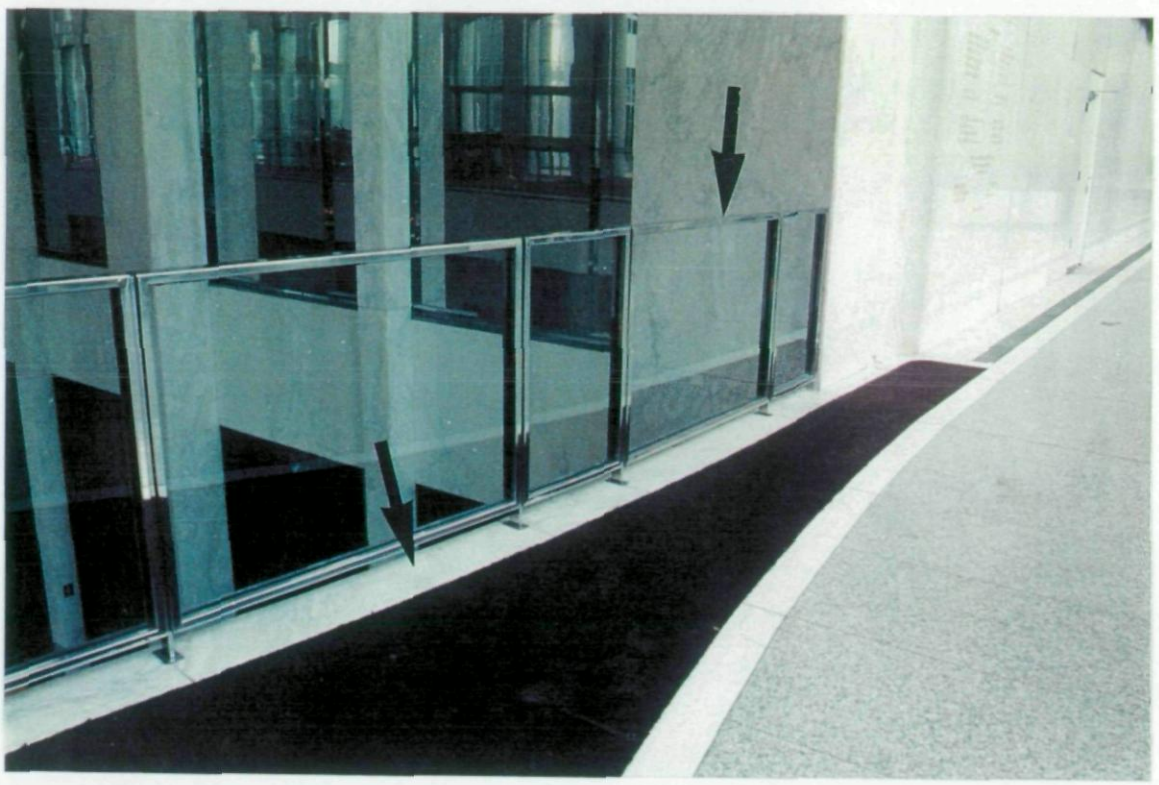
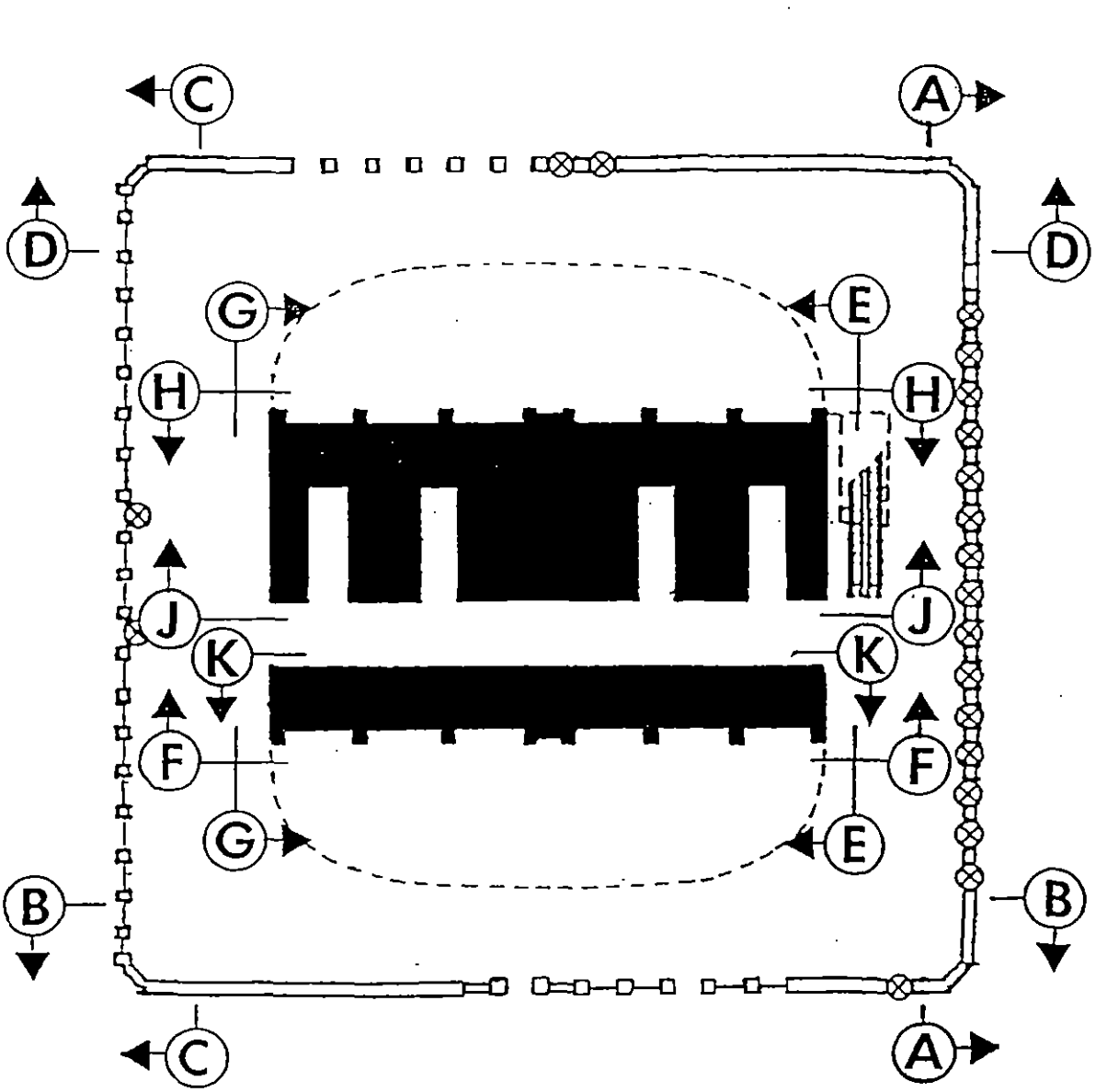
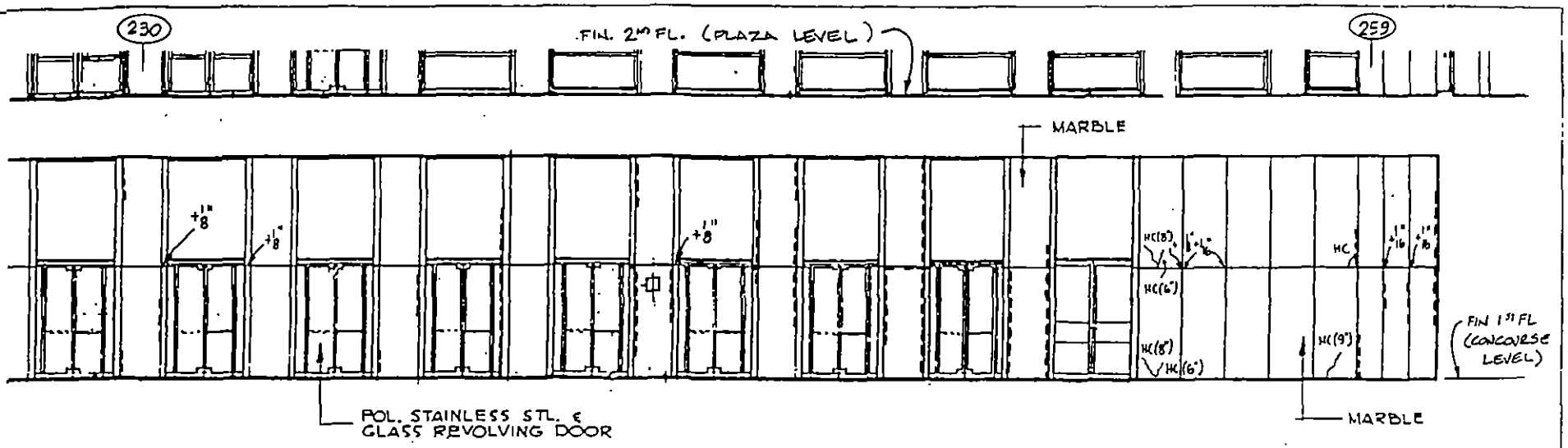


PHOTO M4 - MEZZANINE RAILING AND MARBLE COPING - GENERAL VIEW

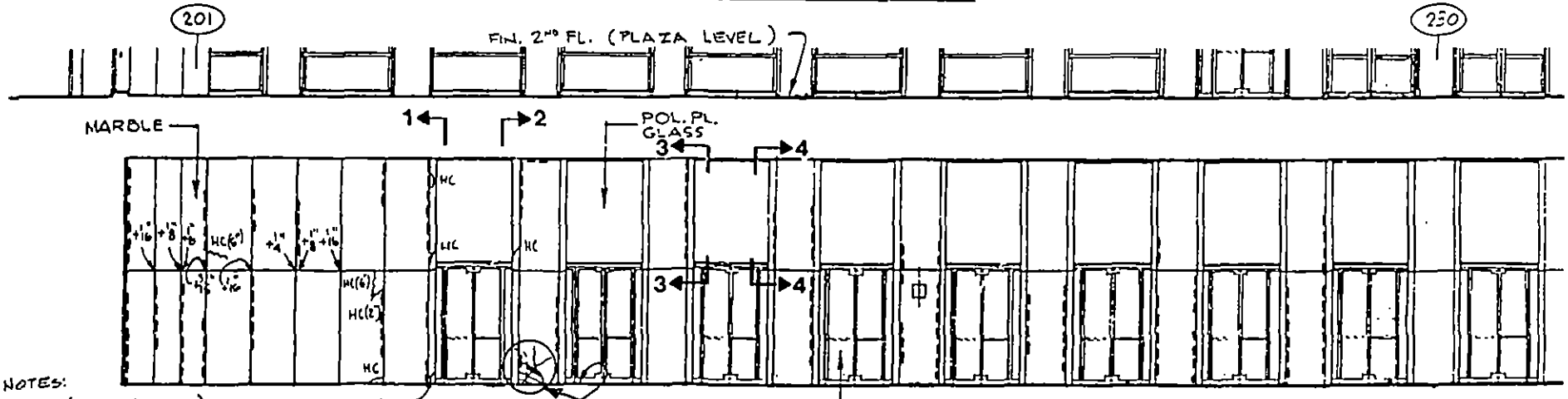


KEY PLAN

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY
LOBBY MARBLE KEY PLAN
Drawing Number: MA



PART ELEVATION A-A (CONCOURSE LEVEL)
EAST WALL (COL. 230 - COL. 259)

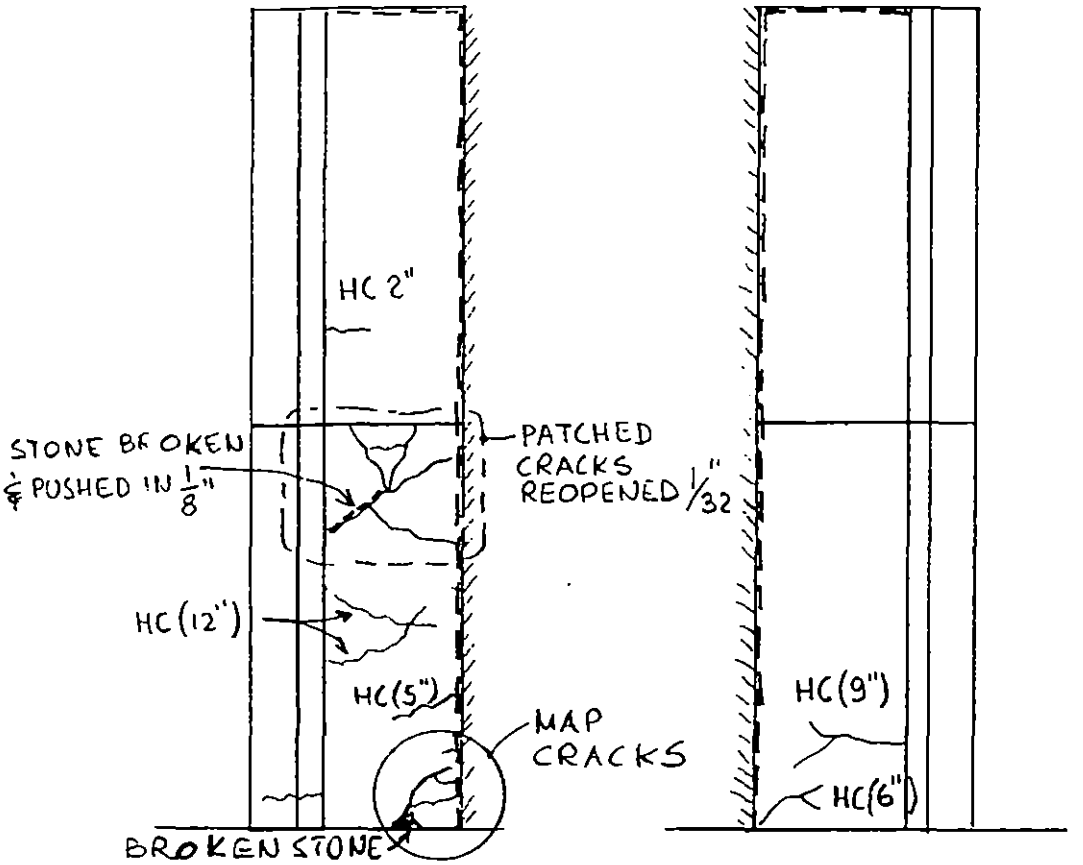


NOTES:
HC = (HAIRLINE CRACK)
(L) = LENGTH
: = MISSING GROUT
+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

PART ELEVATION A-A (CONCOURSE LEVEL)
EAST WALL (COL. 201 - COL 230)

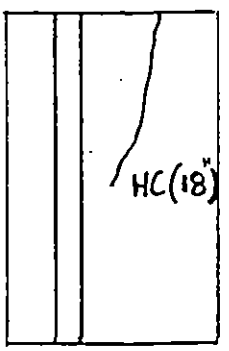
FOR SECTIONS 1-1, 2-2, etc. SEE DWG NO. SK-M1a

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE-CONCOURSE LEVEL - EAST WALL	DWG NO: SK-M1

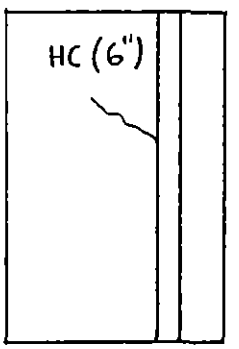


VIEW 1-1

VIEW 2-2

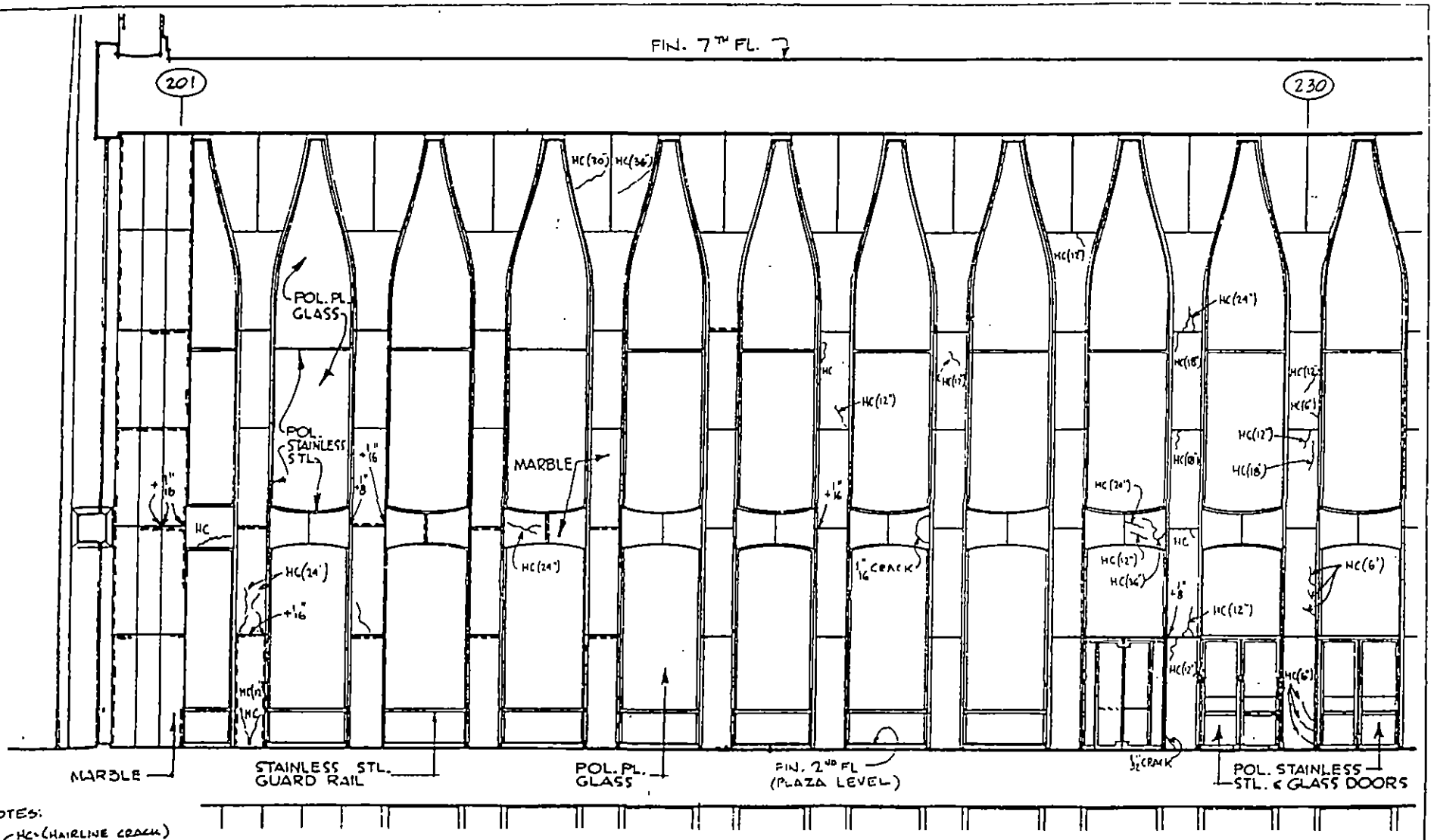


VIEW 3-3



VIEW 4-4

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY
LOBBY MARBLE CONCOURSE LEVEL EAST WALL
Drawing Number: SK-M1A



NOTES:

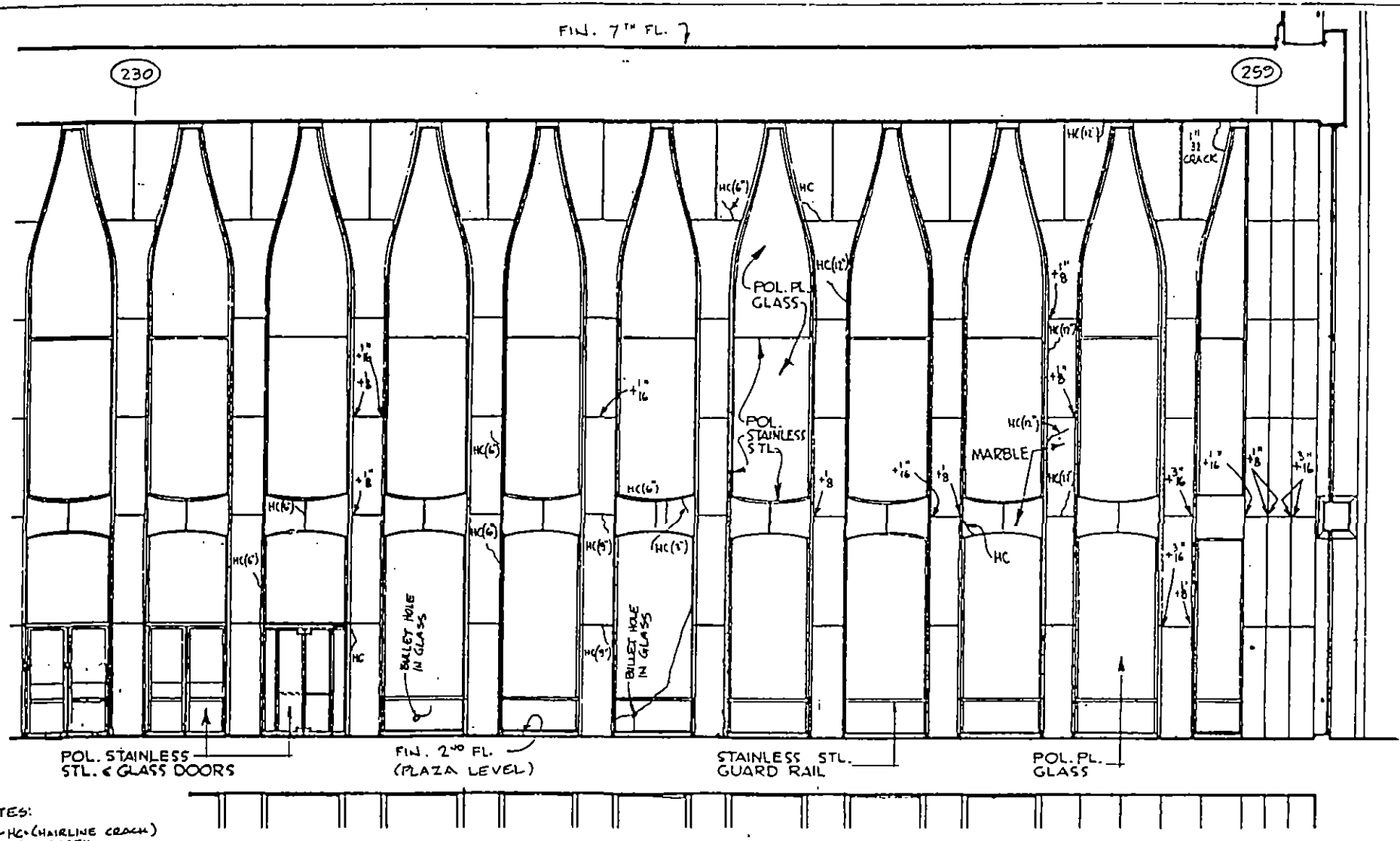
HC = (HAIRLINE CRACK) (L) = LENGTH

: = MISSING GROUT

+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

PART ELEVATION A-A (PLAZA LEVEL)
EAST WALL (COL. 201 - COL 230)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE - PLAZA LEVEL - EAST WALL (N)	DWG NO: SK-M2



NOTES:

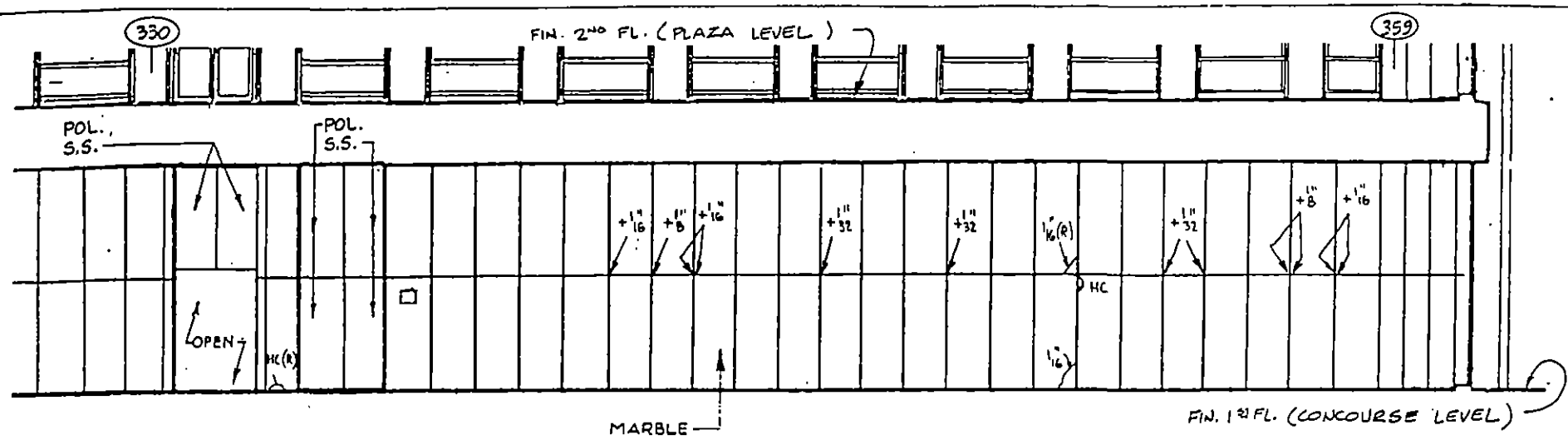
HC = (HAIRLINE CRACK) (L) = LENGTH

= MISSING GROUT

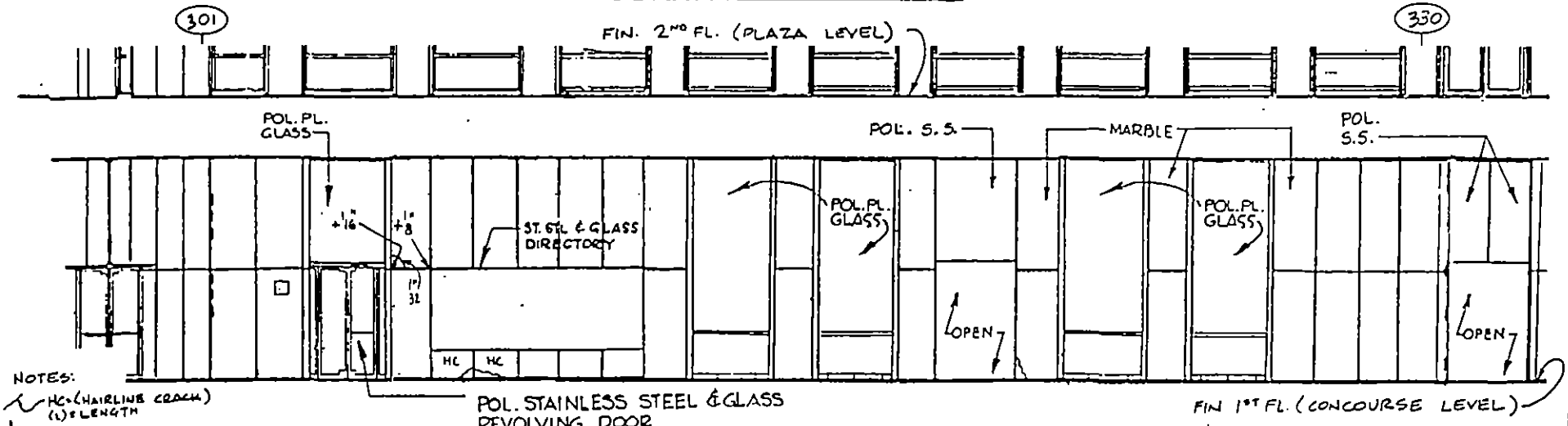
+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

PART ELEVATION A-A (PLAZA LEVEL)
EAST WALL (COL. 230 - COL. 259)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE - PLAZA - LEVEL - EAST WALL (S)	DWG NO: SK-M3



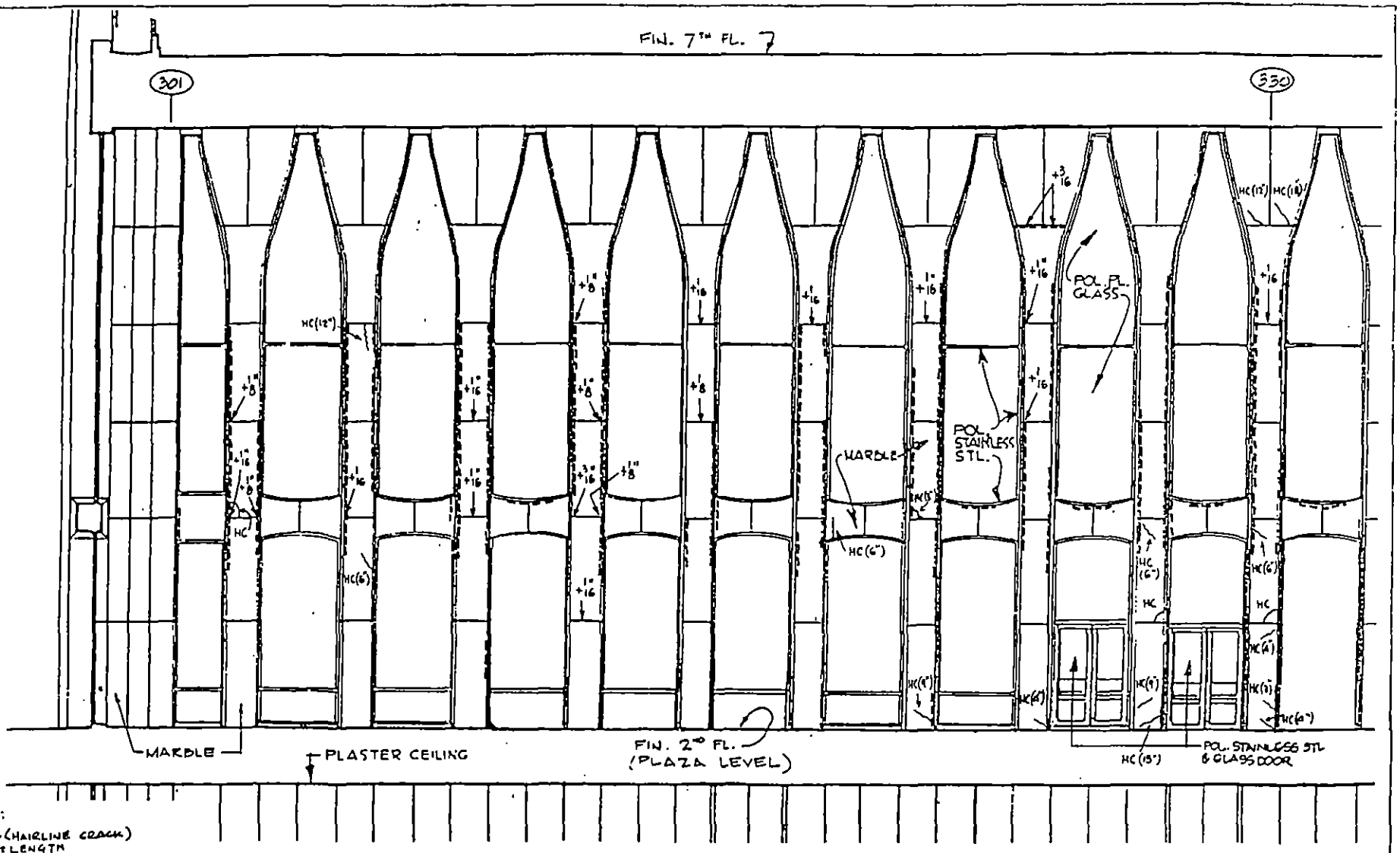
PART ELEVATION B-B (CONCOURSE LEVEL)
SOUTH WALL (COL. 330 - COL. 359)



NOTES:
HC = (HAIRLINE CRACK) (L) = LENGTH
= MISSING GROUT
+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL
(R) REPAIRED CRACK

PART ELEVATION B-B (CONCOURSE LEVEL)
SOUTH WALL (COL. 301 - COL 330)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE-CONCOURSE LEVEL - SOUTH WALL	DWG NO: SK-M4



NOTES:

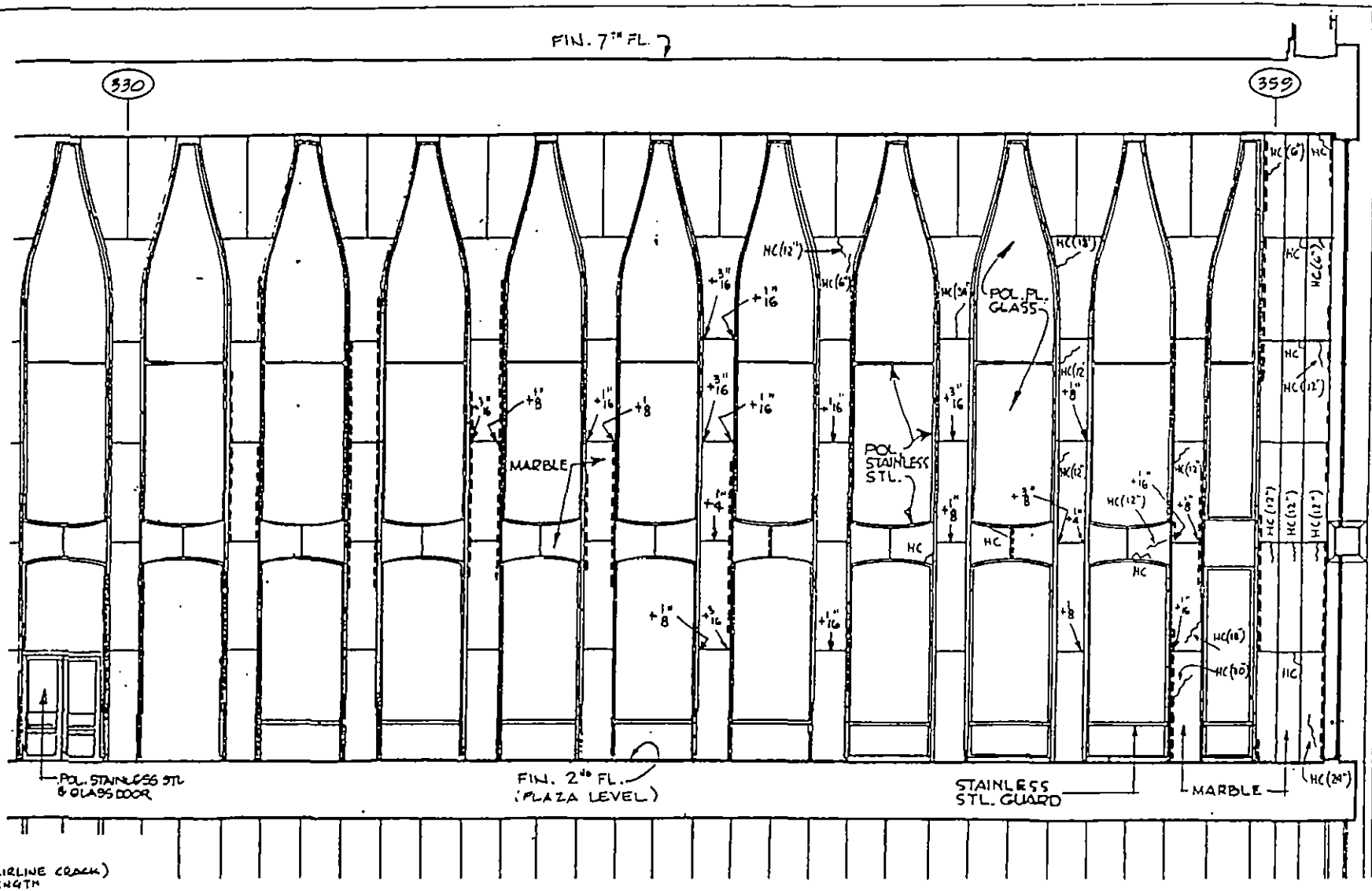
HC = (HAIRLINE CRACK) (L) = LENGTH

= MISSING GROUT

+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

PART ELEVATION B-B (PLAZA LEVEL)
SOUTH WALL (COL.301 - COL.330)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE - PLAZA LEVEL - SOUTH WALL (E)	DWG NO: SK-M5



NOTES:

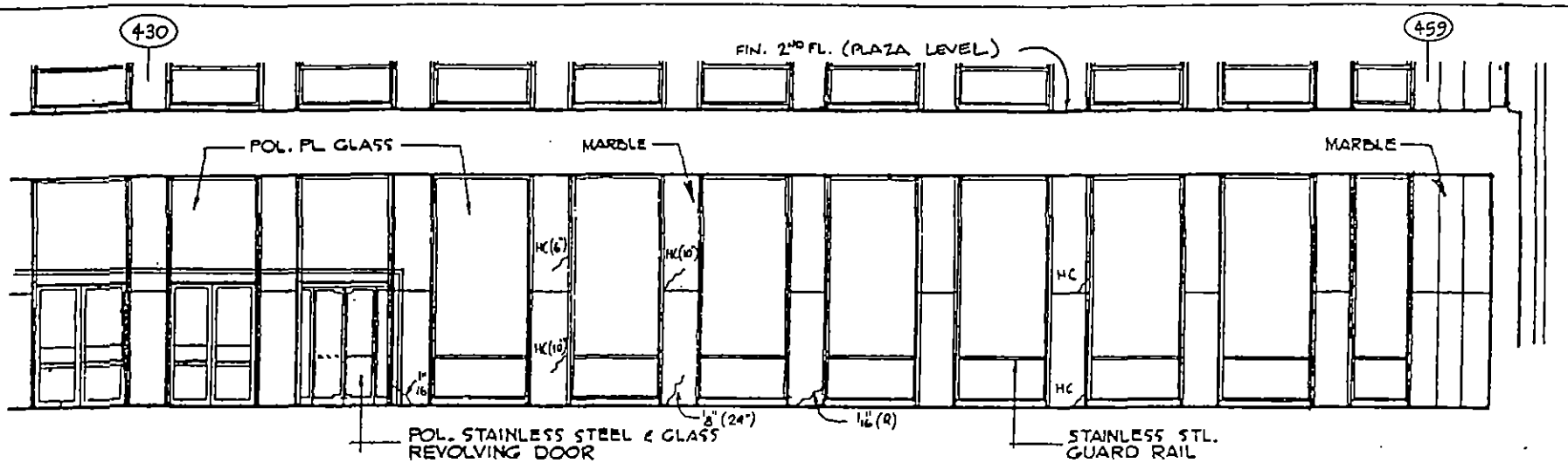
HC = (HAIRLINE CRACK) (L) = LENGTH

= MISSING GROUT

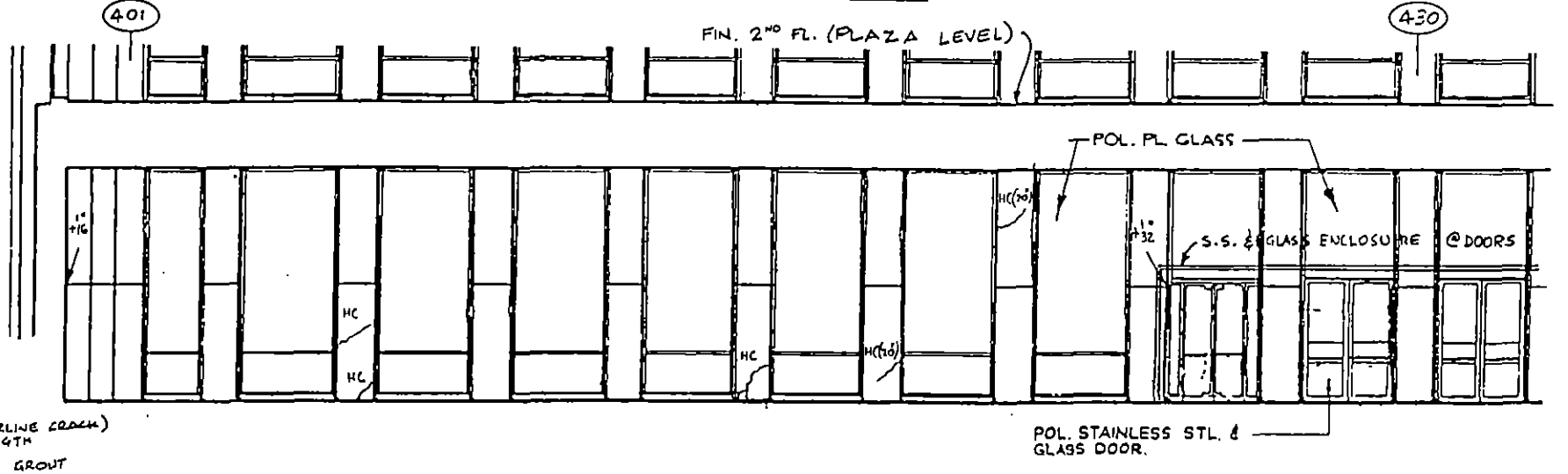
+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

PART ELEVATION B-B (PLAZA LEVEL)
SOUTH WALL (COL.330 - COL.359)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE- PLAZA LEVEL - SOUTH WALL (W)	DWG NO: SK-M6



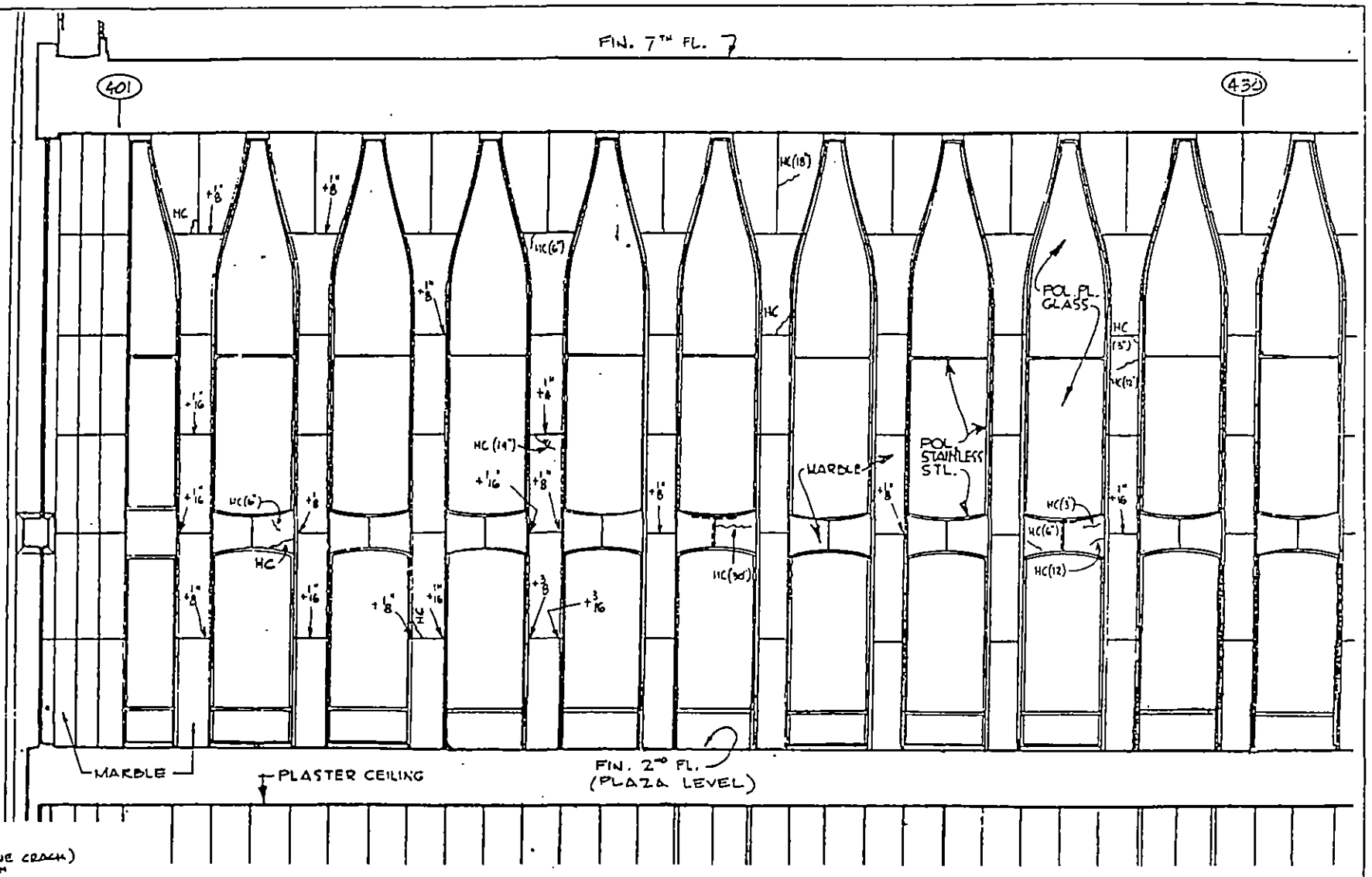
PART ELEVATION C-C (CONCOURSE LEVEL)
WEST WALL (COL. 430 - COL. 459)



NOTES:
HC = (HAIRLINE CRACK)
(L) = LENGTH
= MISSING GROUT
+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL
(R) = REPAIRED CRACK

PART ELEVATION C-C (CONCOURSE LEVEL)
WEST WALL (COL. 401 - COL. 430)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE-CONCOURSE LEVEL - WEST WALL	DWG NO: SK-M7



NOTES:

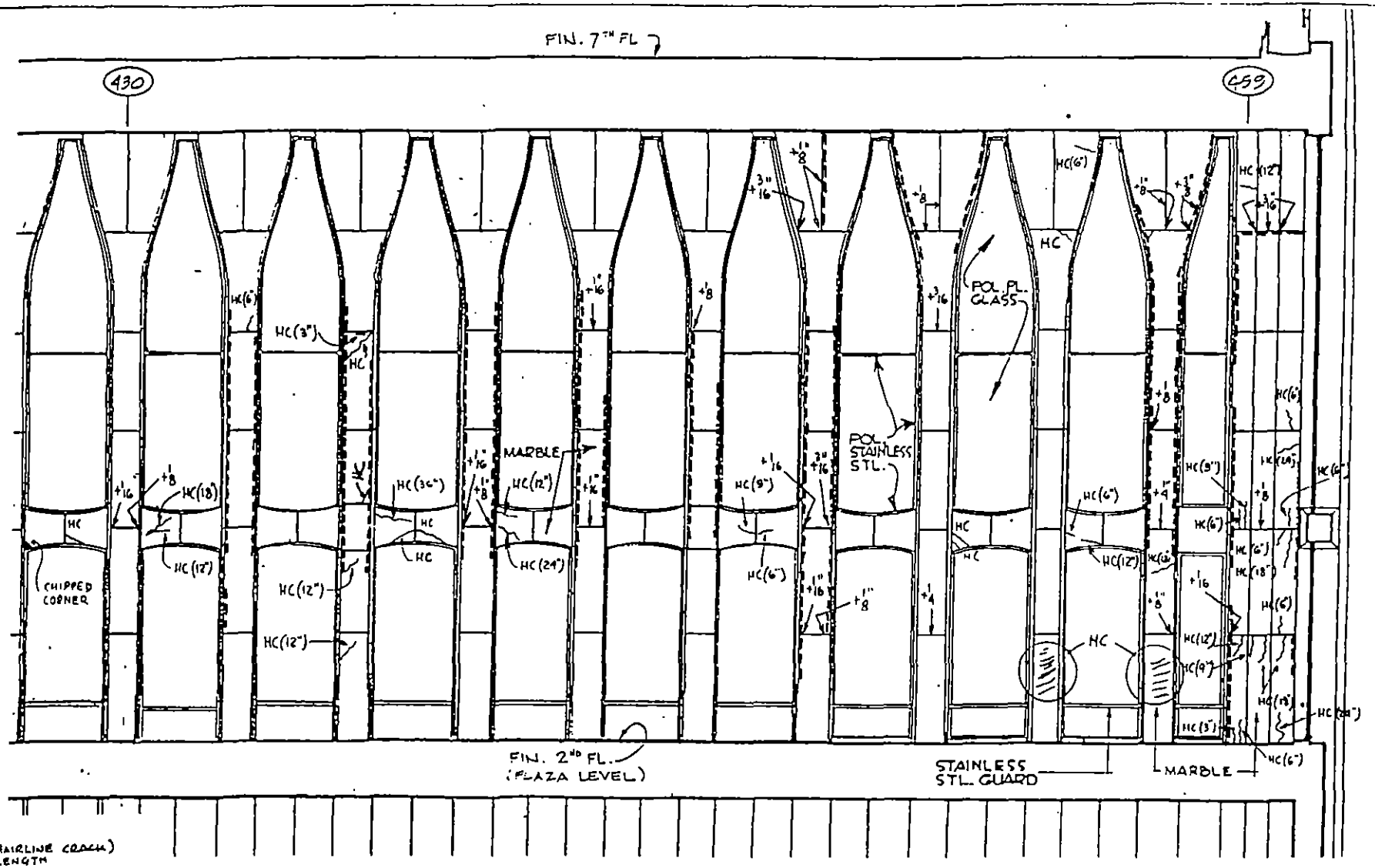
HC = (HAIRLINE CRACK) (L) = LENGTH

= MISSING GROUT

+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

PART ELEVATION C-C (PLAZA LEVEL)
WEST WALL (COL. 401 - COL 430)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE - PLAZA LEVEL - WEST WALL (S)	DWG NO: SK-M8



NOTES:

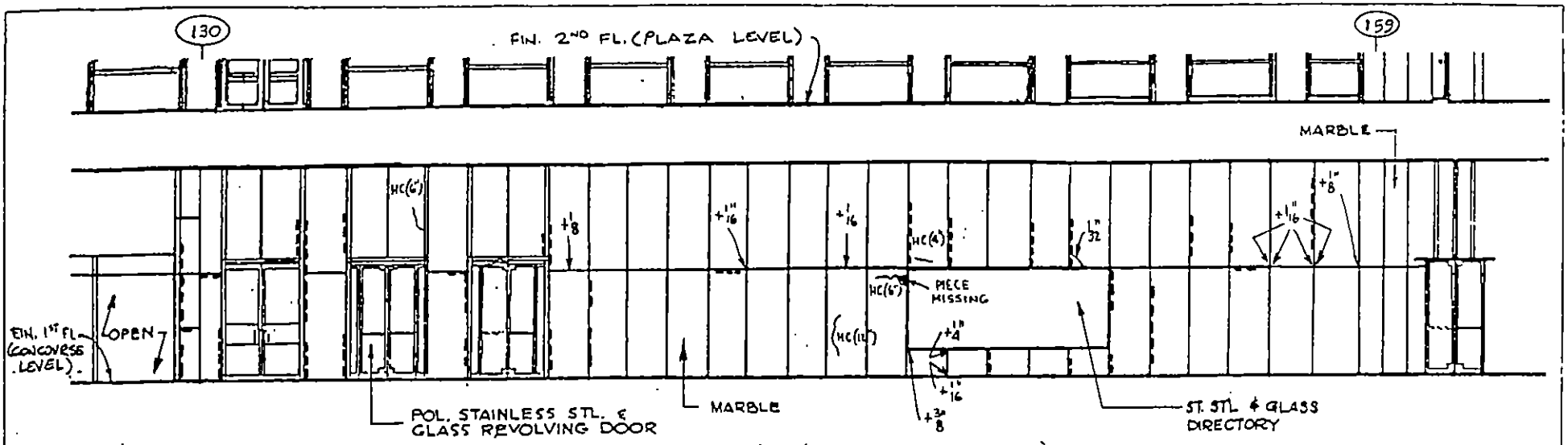
HC = (HAIRLINE CRACK) (L) = LENGTH

= MISSING GROUT

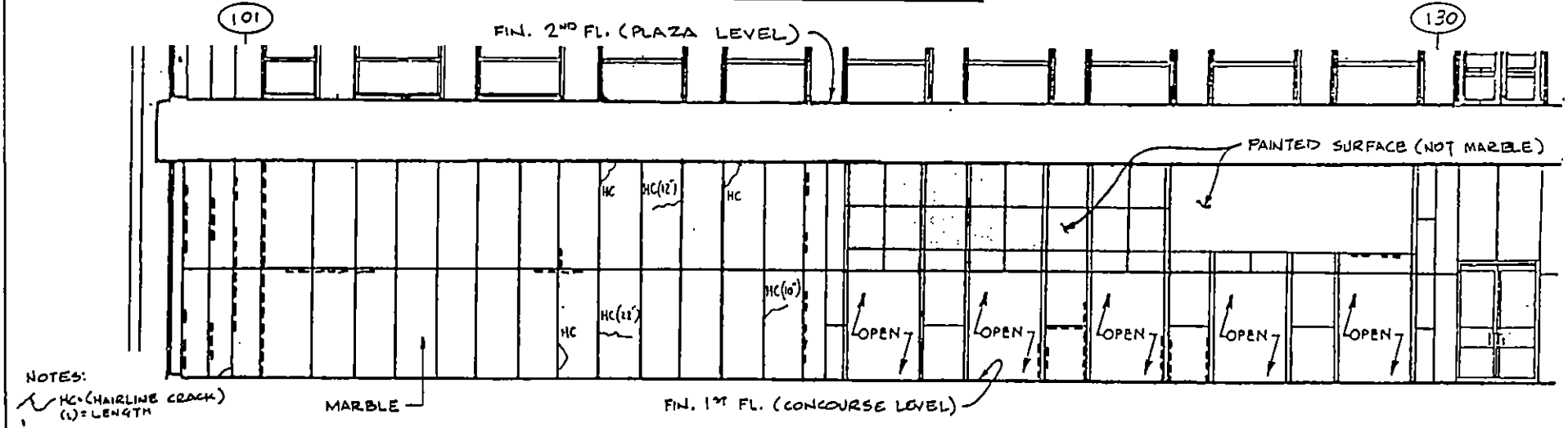
+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

PART ELEVATION C-C (PLAZA LEVEL)
WEST WALL (COL. 430 - COL. 459)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE- PLAZA LEVEL- WEST WALL (N)	DWG NO: SK-M9



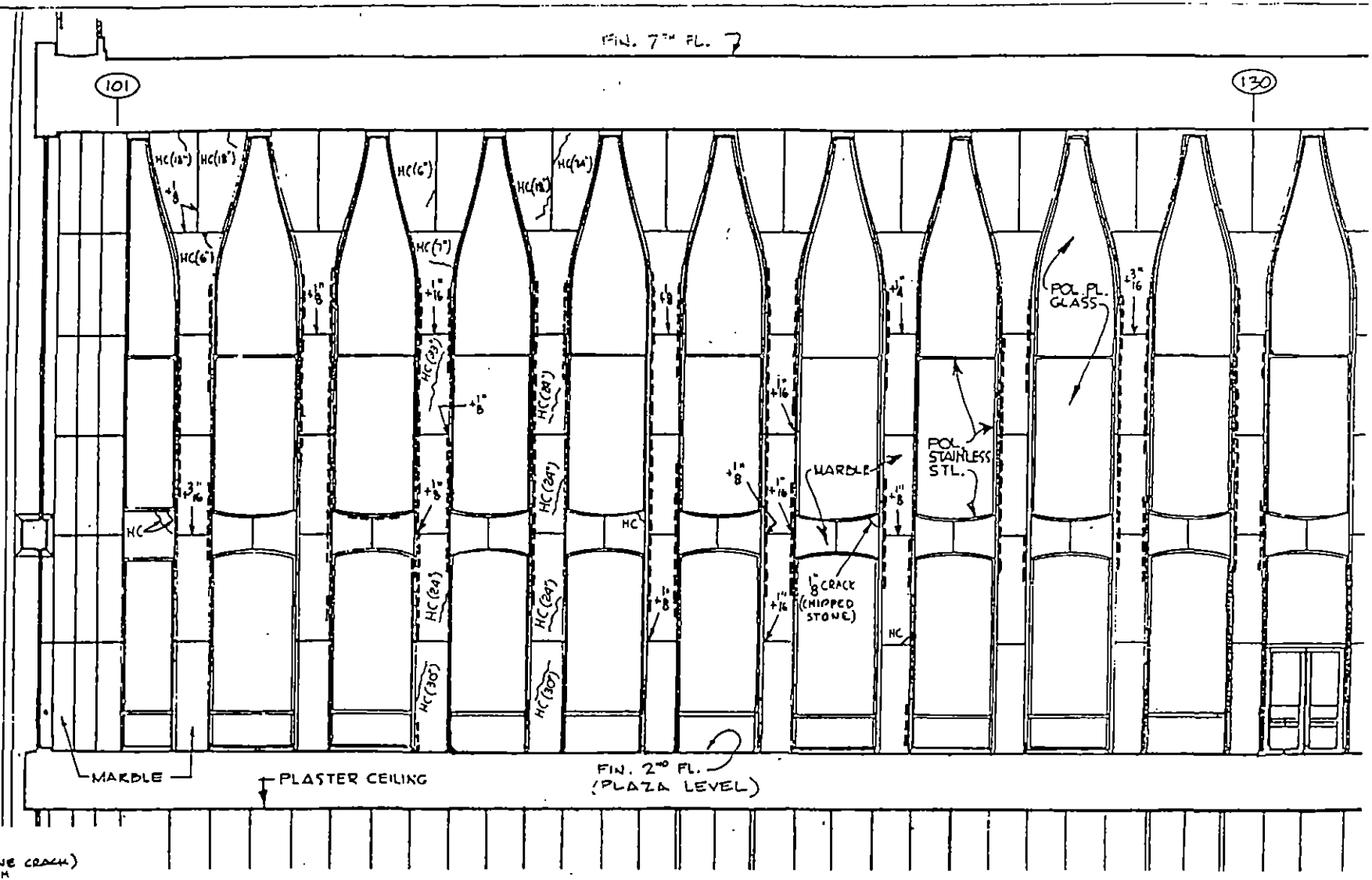
PART ELEVATION D-D (CONCOURSE LEVEL)
NORTH WALL (COL. 130 - COL. 159)



NOTES:
HC = (HAIRLINE CRACK) (L) = LENGTH
= MISSING GROUT
+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

PART ELEVATION D-D (CONCOURSE LEVEL)
NORTH WALL (COL. 101 - COL 130)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE-CONCOURSE LEVEL - NORTH WALL	DWG NO: SK-M10



NOTES:

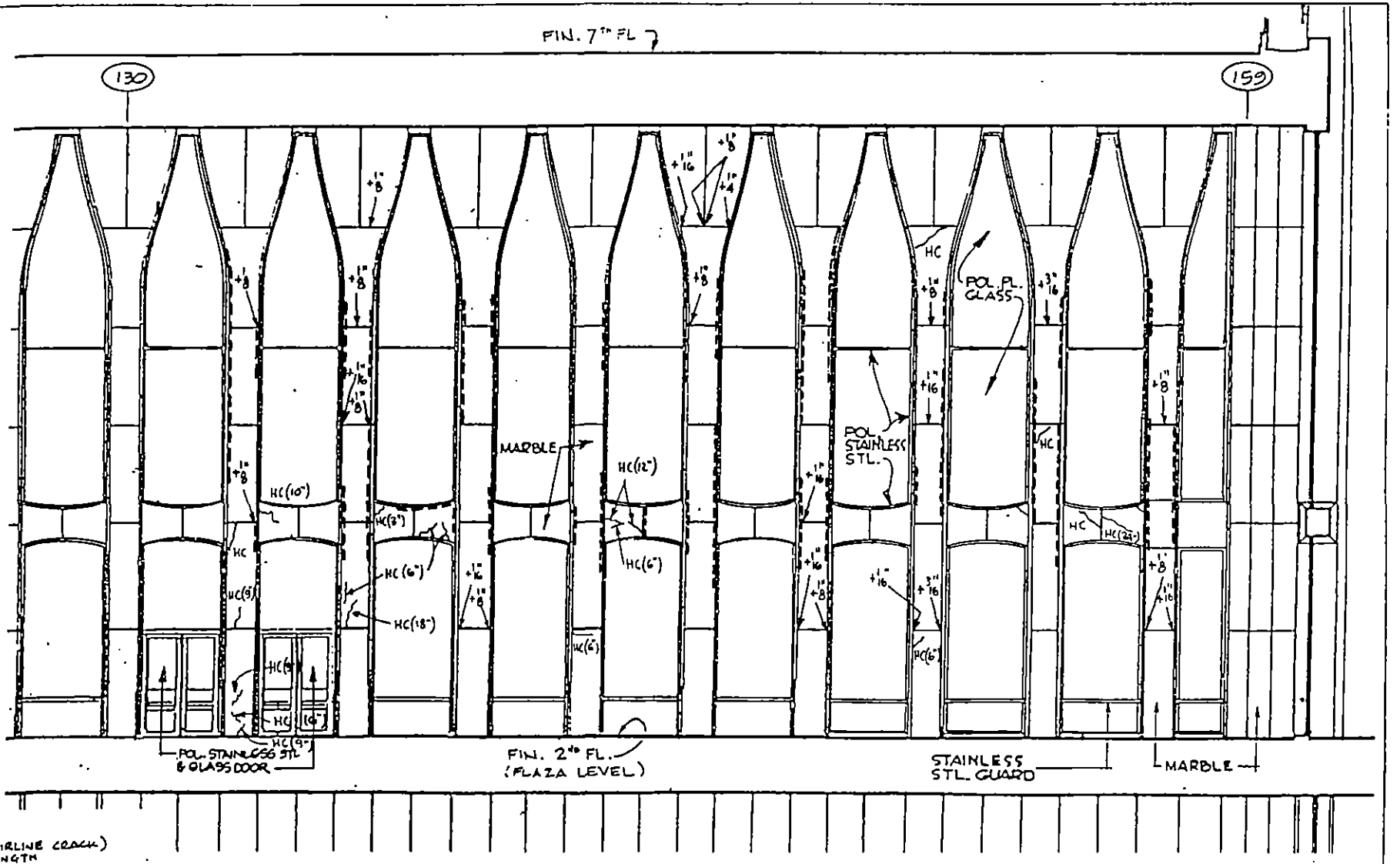
HC = (HAIRLINE CRACK) (L) = LENGTH

= MISSING GROUT

+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

PART ELEVATION D-D (PLAZA LEVEL)
NORTH WALL (COL. 101 - COL. 130)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE - PLAZA LEVEL - NORTH WALL (W)	DWG NO: SK-M11



NOTES:

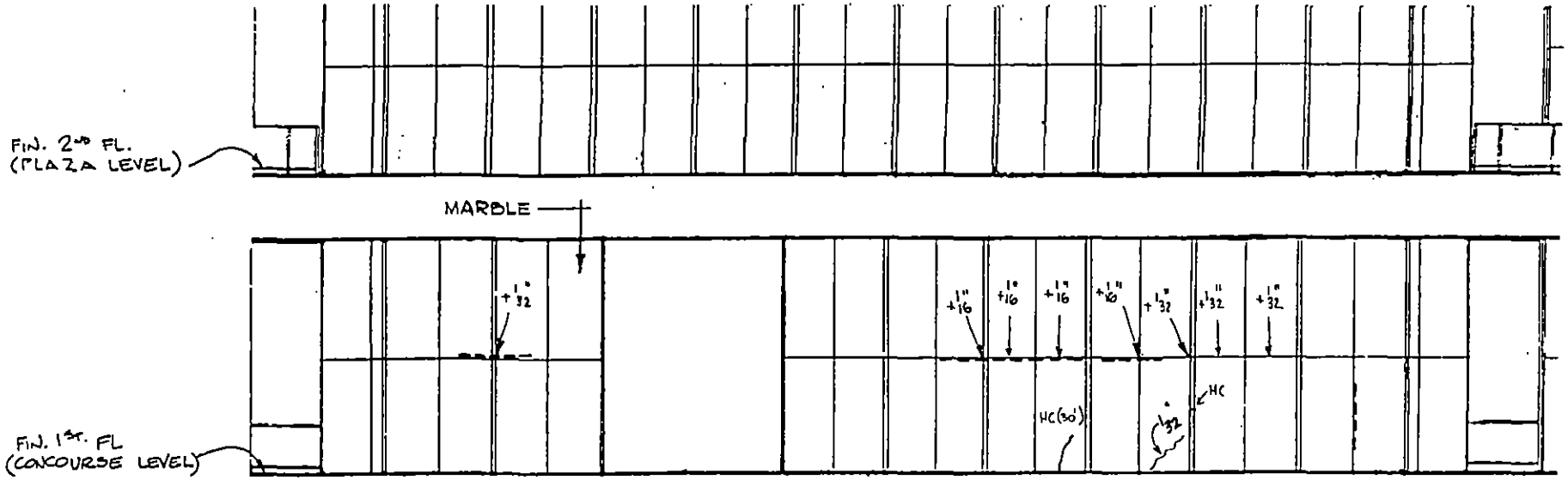
HC = (HAIRLINE CRACK) (L) = LENGTH

= MISSING GROUT

+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

PART ELEVATION D-D (PLAZA LEVEL)
NORTH WALL (COL. 130 - COL. 159)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE - PLAZA LEVEL - NORTH WALL (E)	DWG NO: SK-H12



ELEVATION E-E (CONCOURSE LEVEL)
EAST CORE WALL

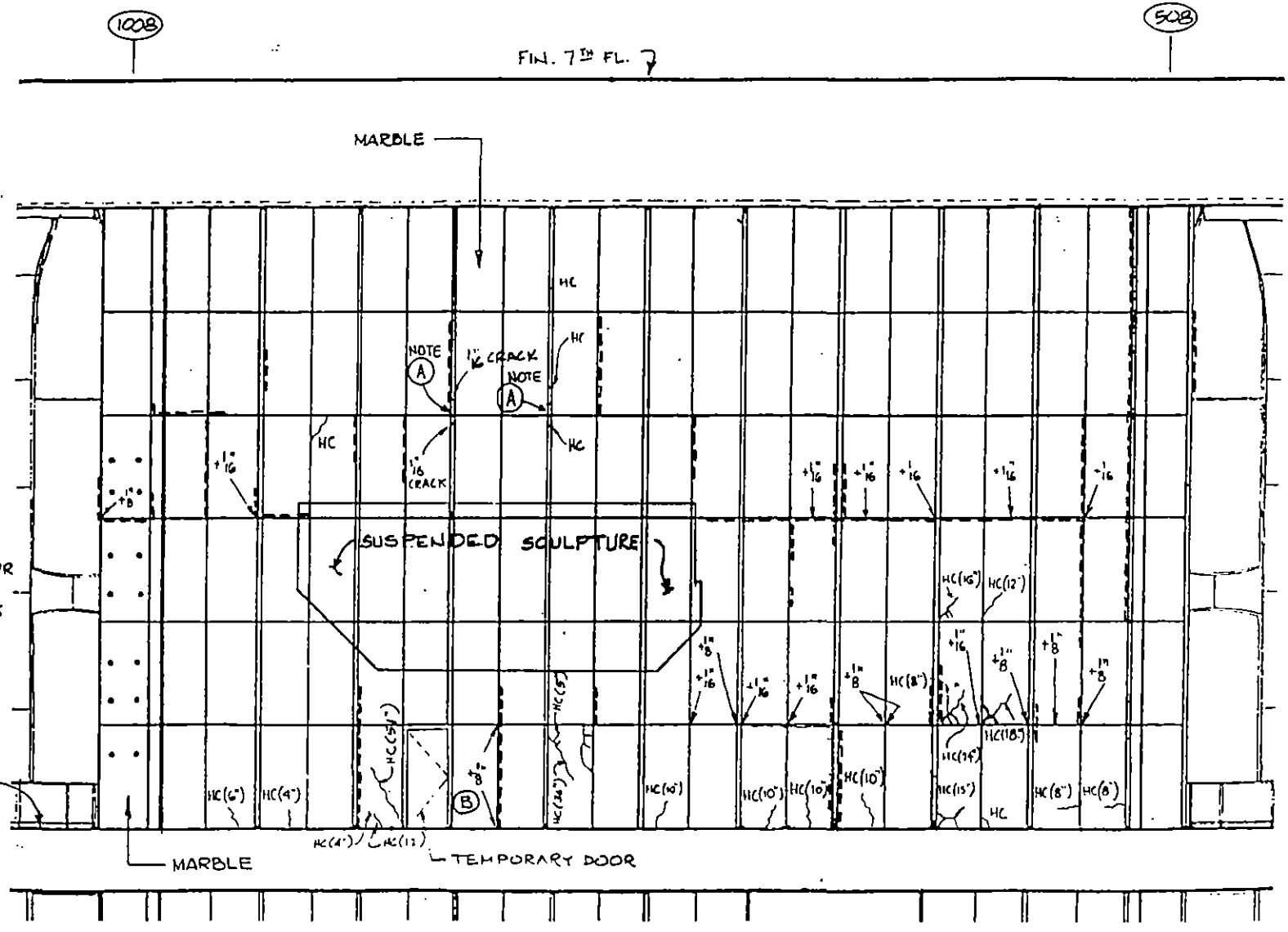
NOTES:

HC=(HAIRLINE CRACK)
(L)=LENGTH

= MISSING GROUT

+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE-CONCOURSE LEVEL- EAST CORE WALL	DWG NO: SK-M13



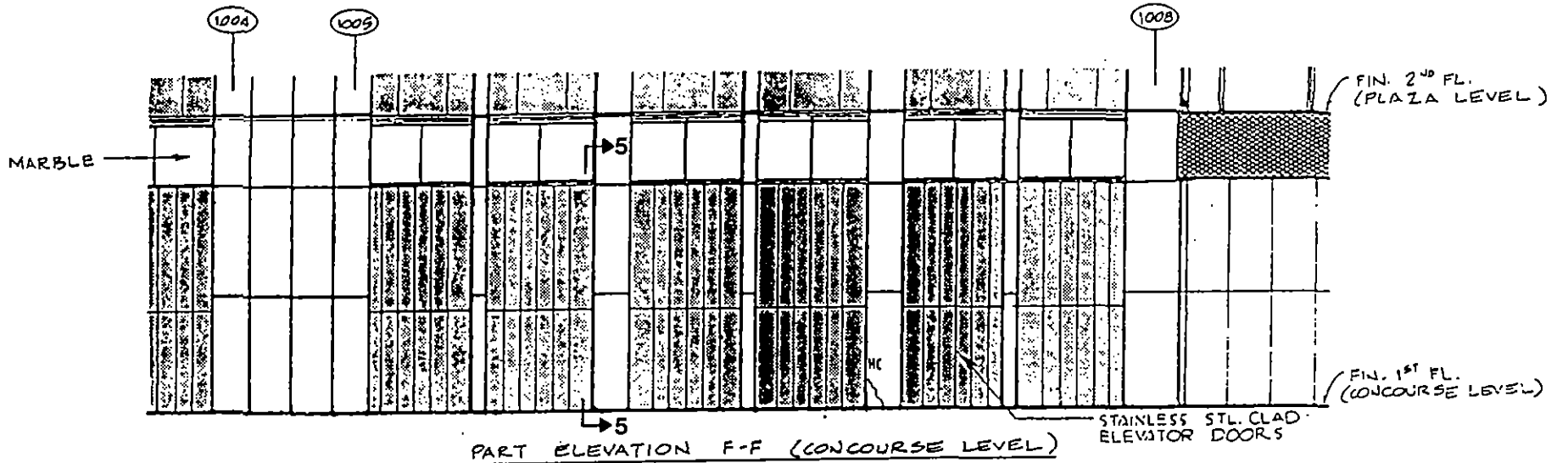
NOTE (A):
STONE BROKEN & PUSHED IN ¼" (NOT LOOSE).

NOTE (B):
PANNEL ADJACENT TO DOOR HOLLOW SOUNDING WHEN STRUCK BY HAND. MOVES SLIGHTLY.

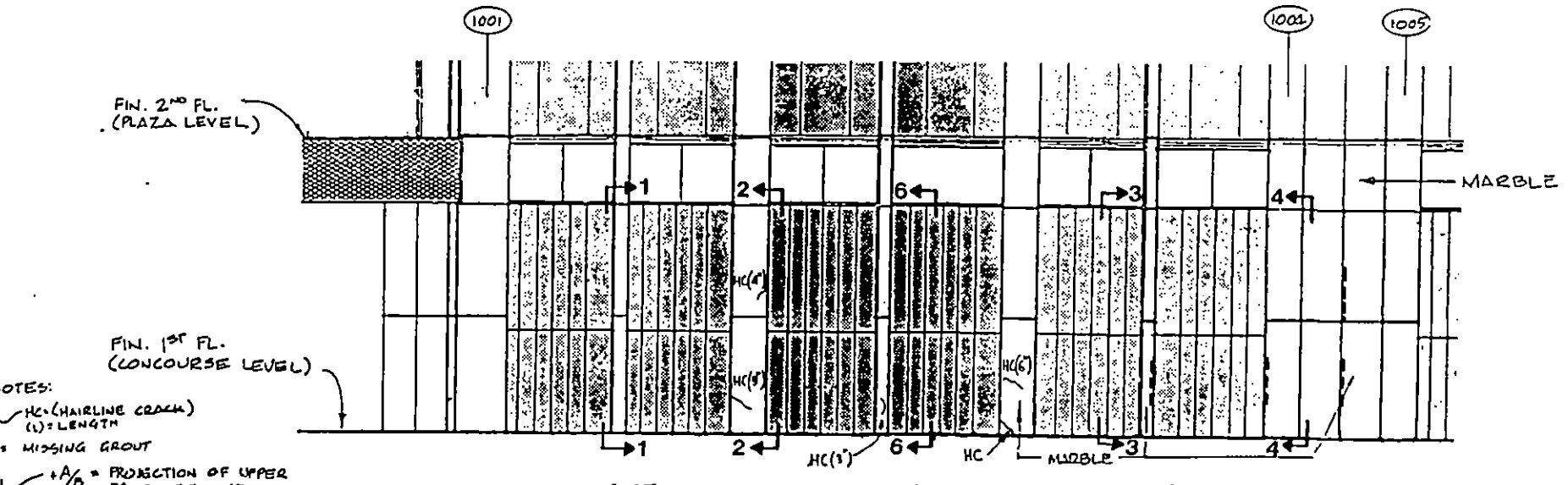
NOTES:
HC: (HAIRLINE CRACK) (L): LENGTH
: MISSING GROUT
+A/B : PROJECTION OF UPPER PANEL BEYOND LOWER PANEL
• : ANCHORS INSTALLED 3/91

ELEVATION E-E (PLAZA LEVEL)
EAST CORE WALL

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE – PLAZA LEVEL- EAST CORE WALL	DWG NO: SK-M14

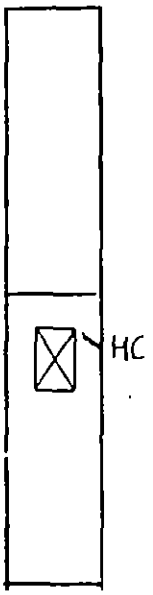


PART ELEVATION F-F (CONCOURSE LEVEL)
SOUTH CORE WALL (COL.1005 - COL.1008)

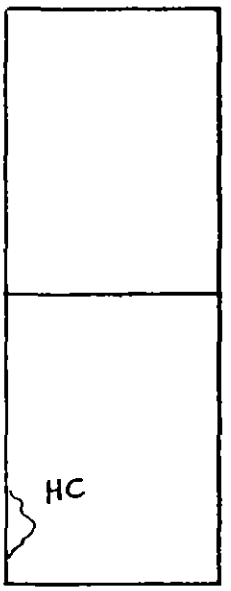


PART ELEVATION F-F (CONCOURSE LEVEL)
SOUTH CORE WALL (COL 1001 - COL.1005)

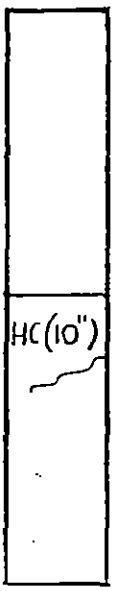
THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE - CONCOURSE LEVEL - SOUTH CORE WALL	DWG NO: SK-M15



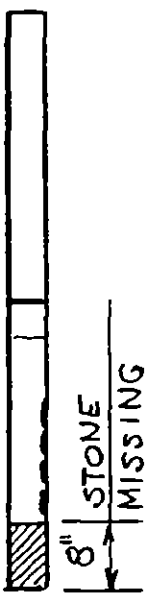
VIEW 1-1



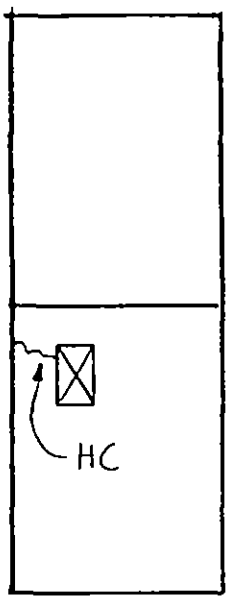
VIEW 2-2



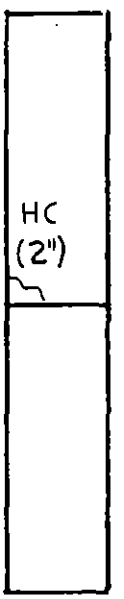
VIEW 3-3



VIEW 4-4

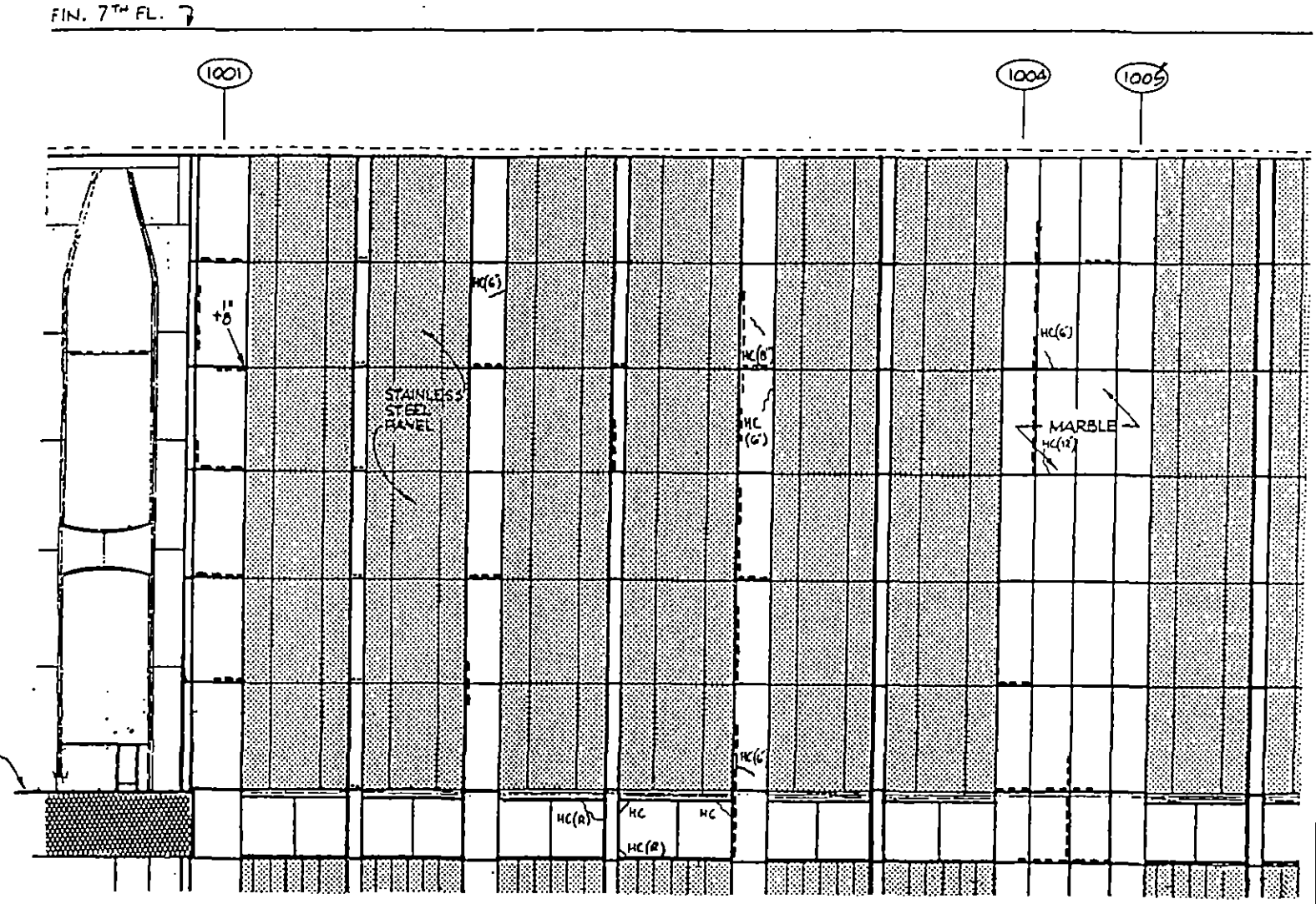


VIEW 5-5



VIEW 6-6

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY
LOBBY MARBLE CONCOURSE LEVEL SOUTH CORE WALL
Drawing Number: SK-M15A



NOTES:

HC = (HAIRLINE CRACK) (L) = LENGTH

= MISSING GROUT

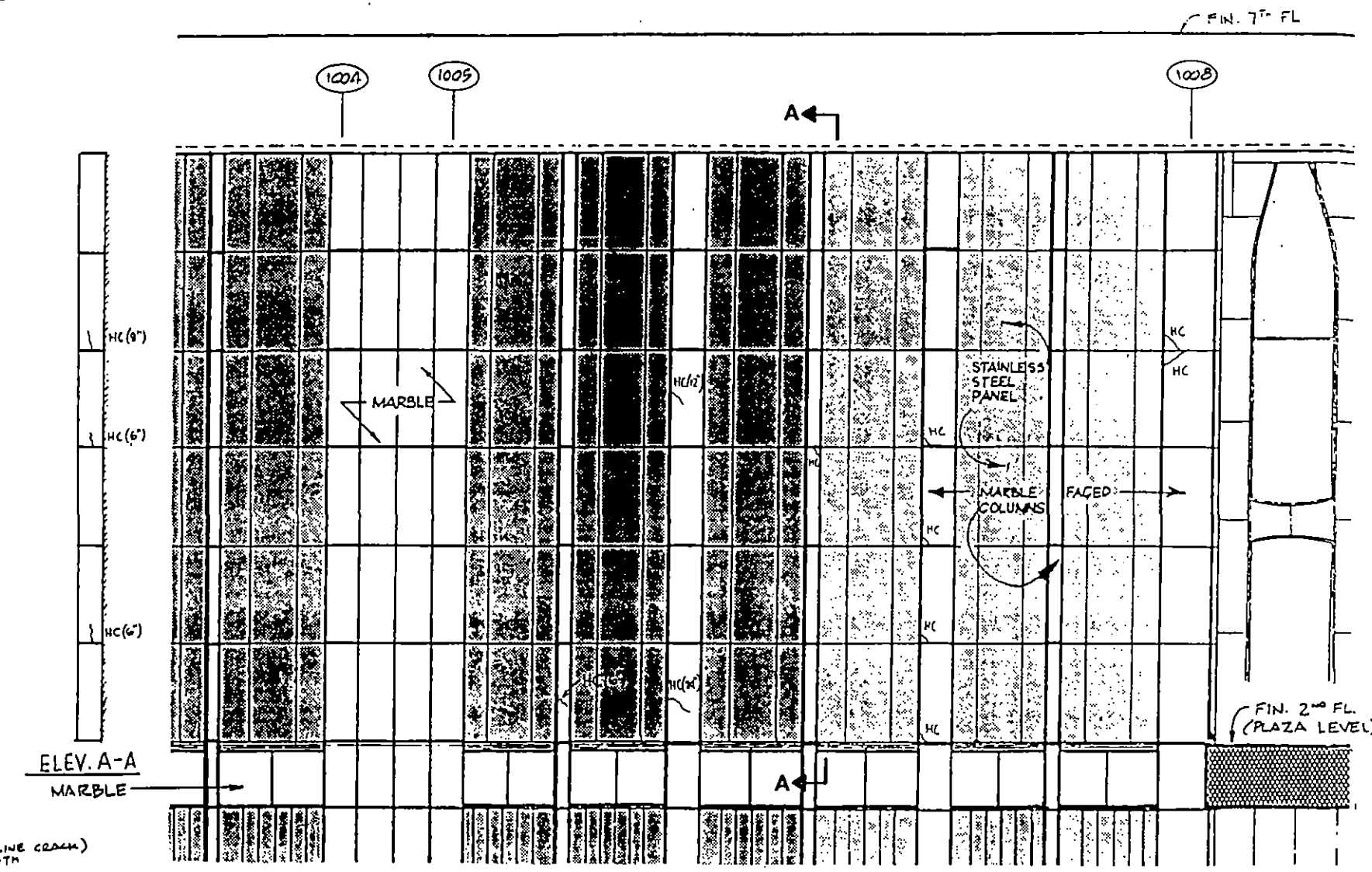
+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

(R) = REPAIRED CRACK

PART ELEVATION F-F (PLAZA LEVEL)

SOUTH CORE WALL (COL. 1001 - COL. 1005)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE – PLAZA LEVEL – SOUTH CORE WALL	DWG NO: SK-M16



NOTES:

HC = (HAIRLINE CRACK) (L) = LENGTH

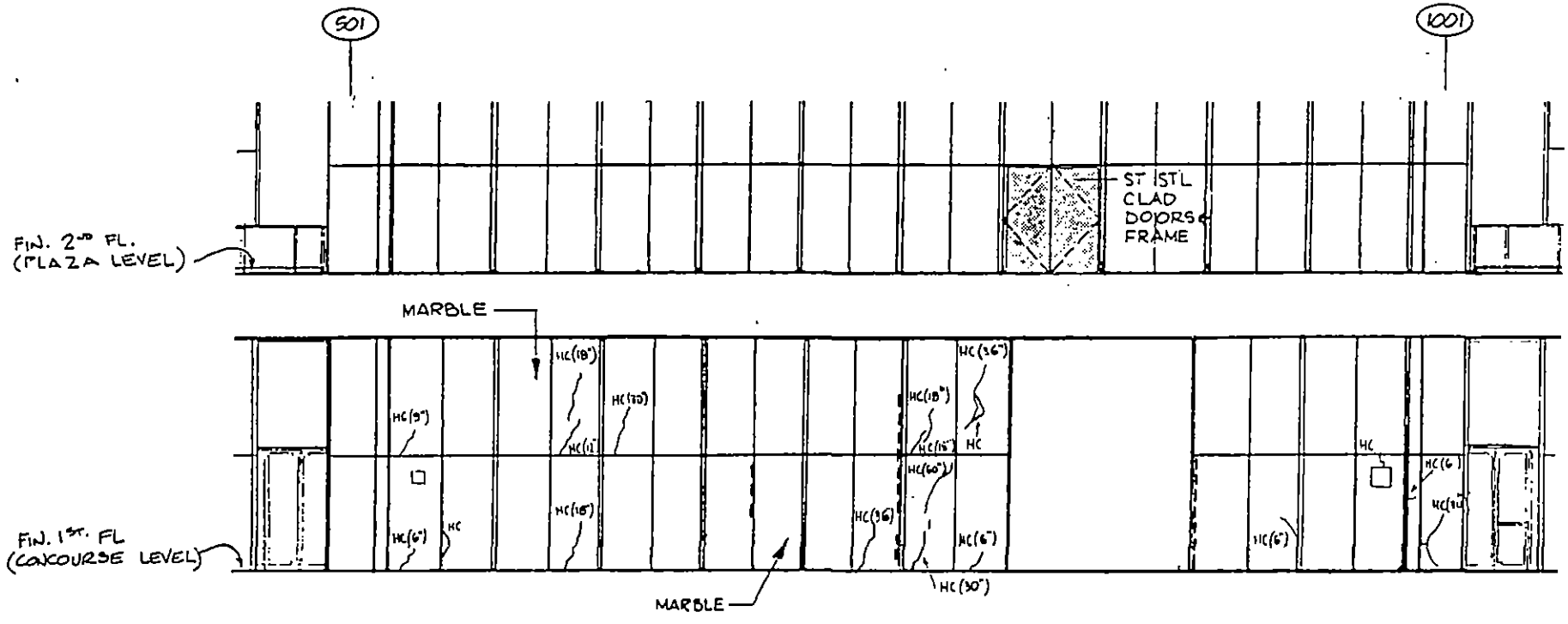
= MISSING GROUT

+A/D = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

PART ELEVATION F·F (PLAZA LEVEL)

SOUTH CORE WALL (COL. 1005 - COL. 1008)

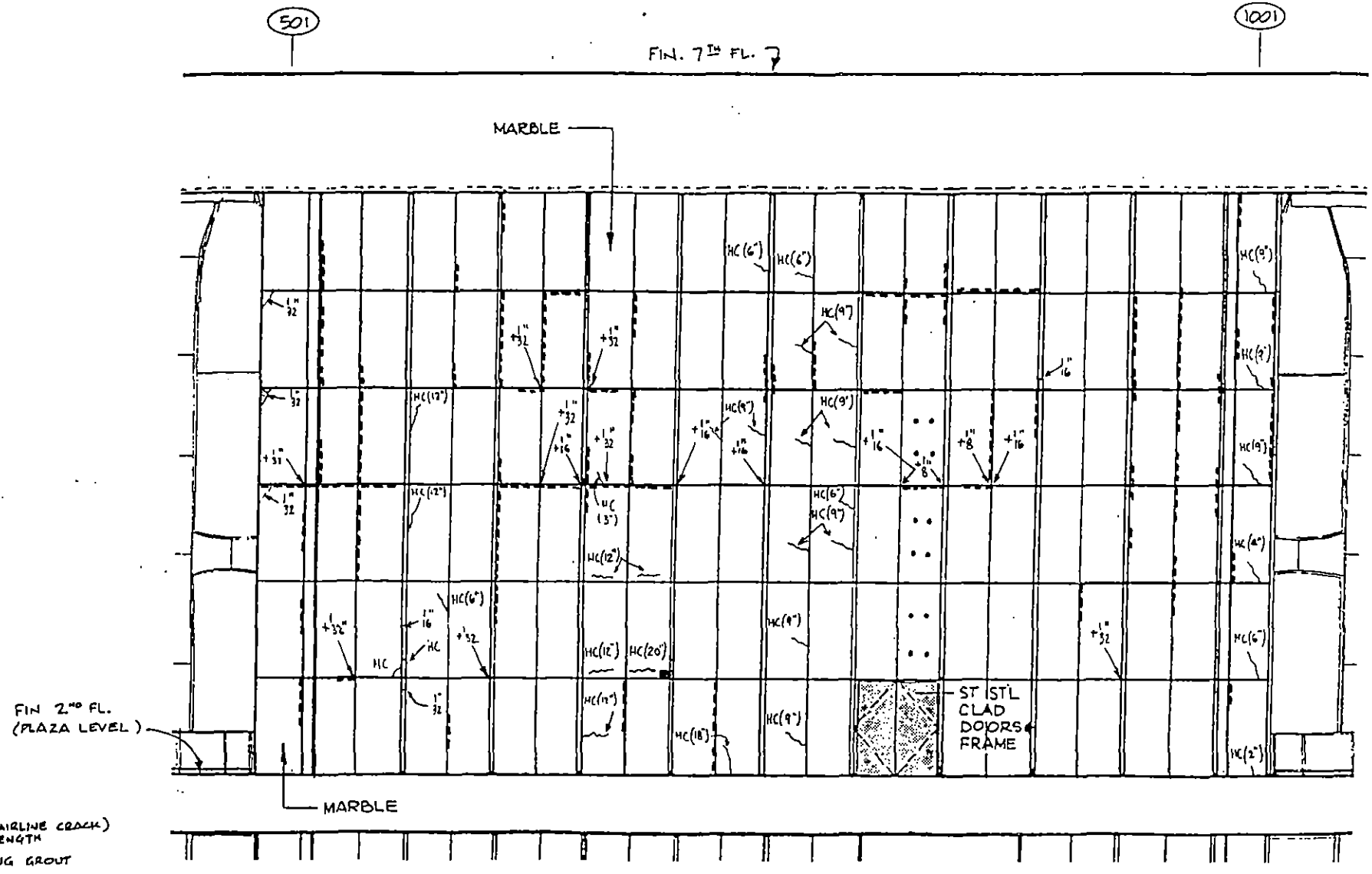
THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE – PLAZA LEVEL – SOUTH CORE WALL	DWG NO: SK-M17



ELEVATION G-G (CONCOURSE LEVEL)
WEST CORE WALL

NOTES:
HC=(HAIRLINE CRACK) (L)=LENGTH
= MISSING GROUT
+A/8 = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE-CONCOURSE LEVEL- WEST CORE WALL	DWG NO: SK-M18



NOTES:

HC = (HAIRLINE CRACK) (L) = LENGTH

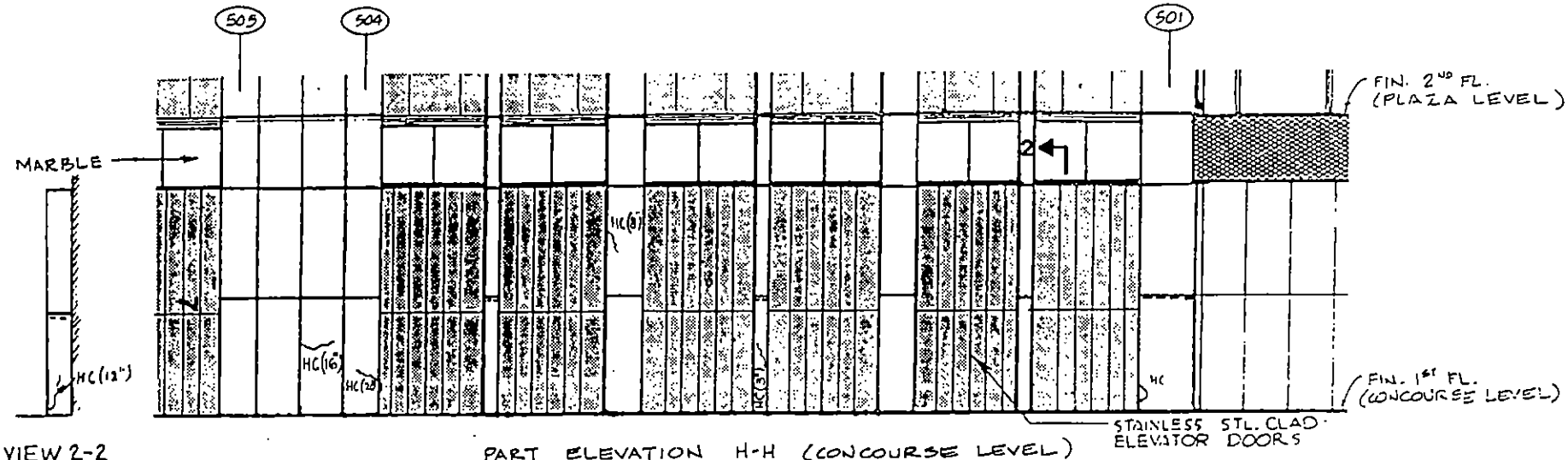
= MISSING GROUT

+A/B = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL

● = ANCHORS INSTALLED 3/91

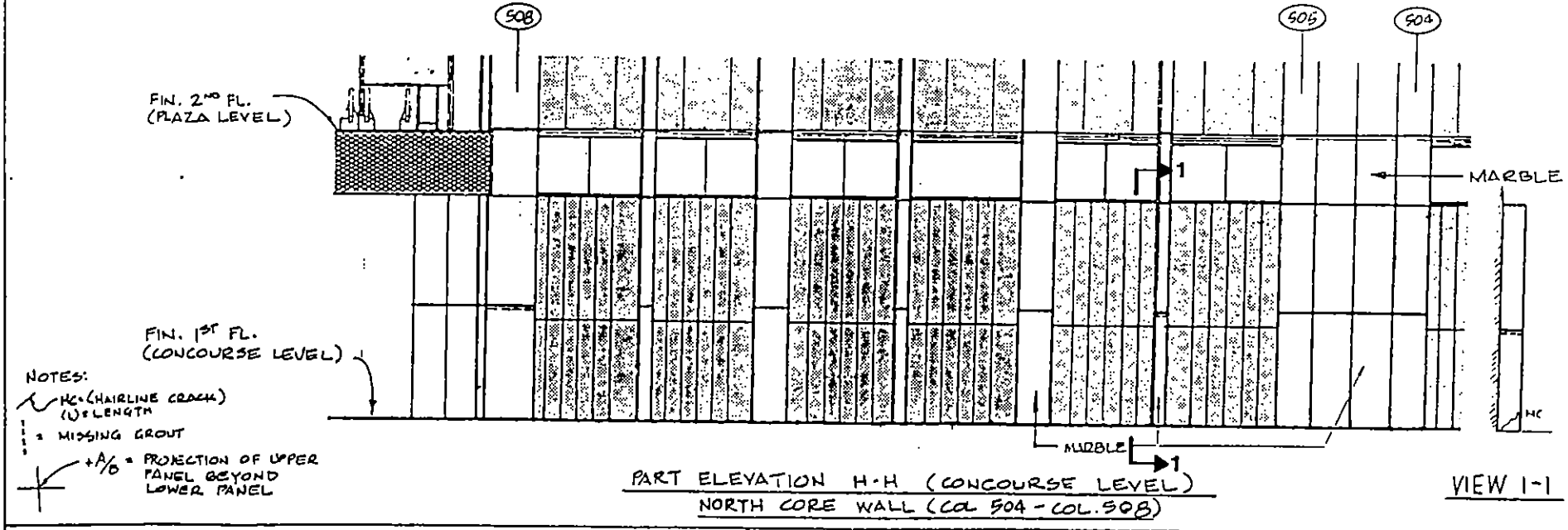
ELEVATION G-G (PLAZA LEVEL)
WEST CORE WALL

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE – PLAZA LEVEL- WEST CORE WALL	DWG NO: SK-M19



VIEW 2-2

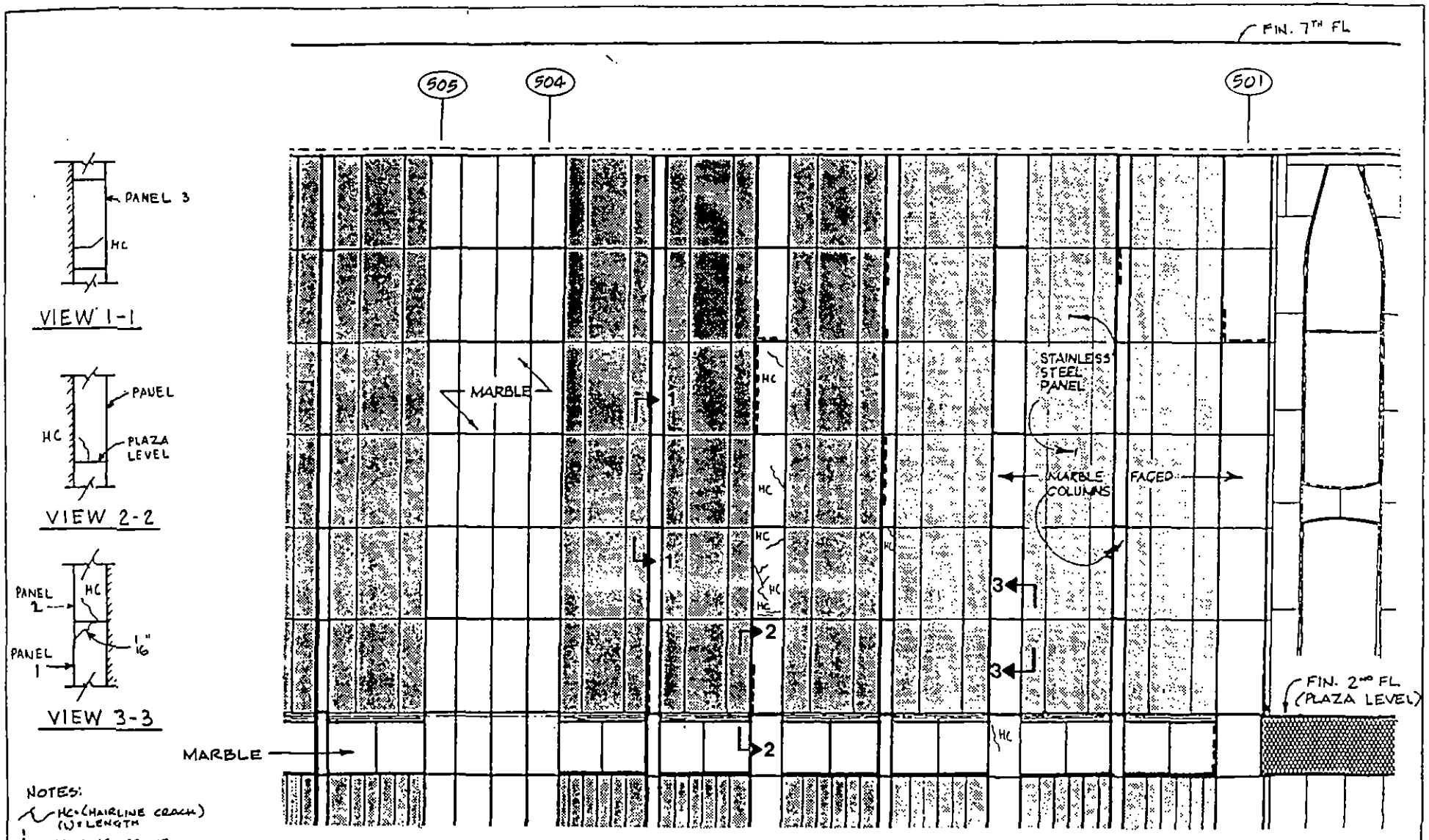
PART ELEVATION H-H (CONCOURSE LEVEL)
NORTH CORE WALL (COL. 501 - COL. 504)



PART ELEVATION H-H (CONCOURSE LEVEL)
NORTH CORE WALL (COL 504 - COL. 508)

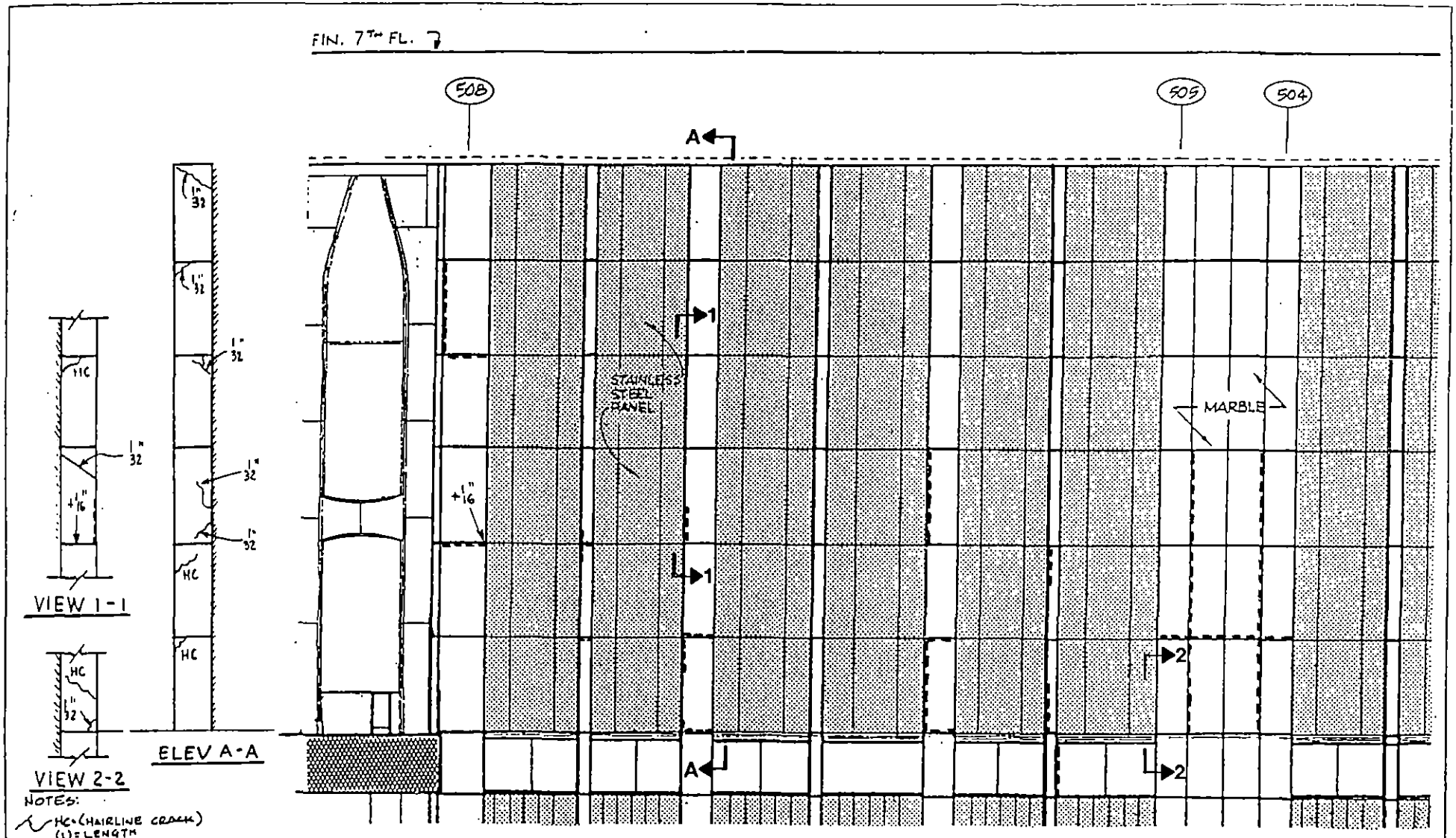
VIEW 1-1

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE - CONCOURSE LEVEL - NORTH CORE WALL	DWG NO: SK-M20



PART ELEVATION H-H (PLAZA LEVEL)

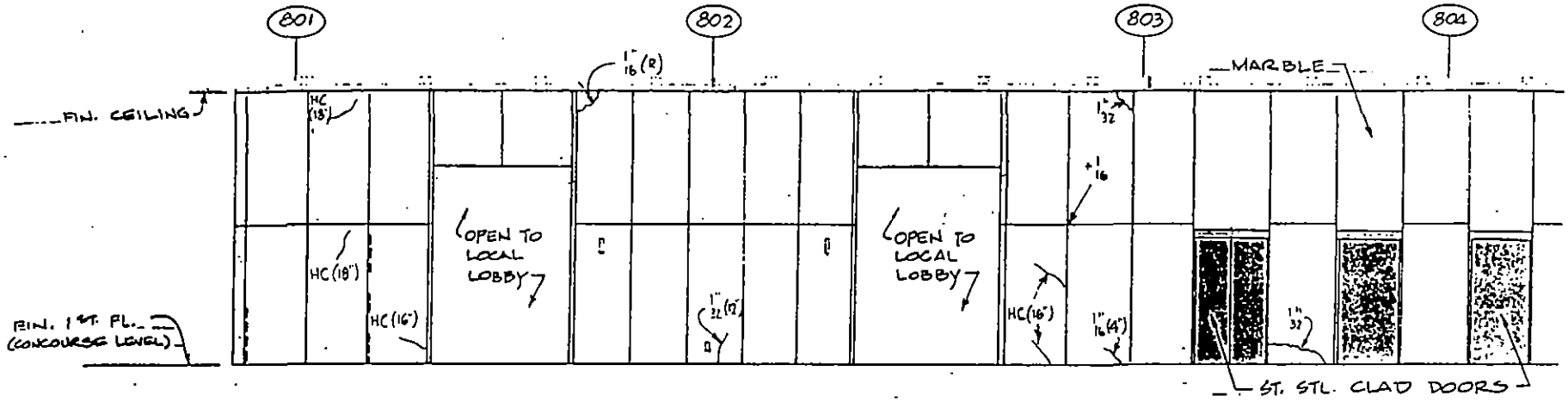
NORTH CORE WALL (COL. 501 - COL. 504)



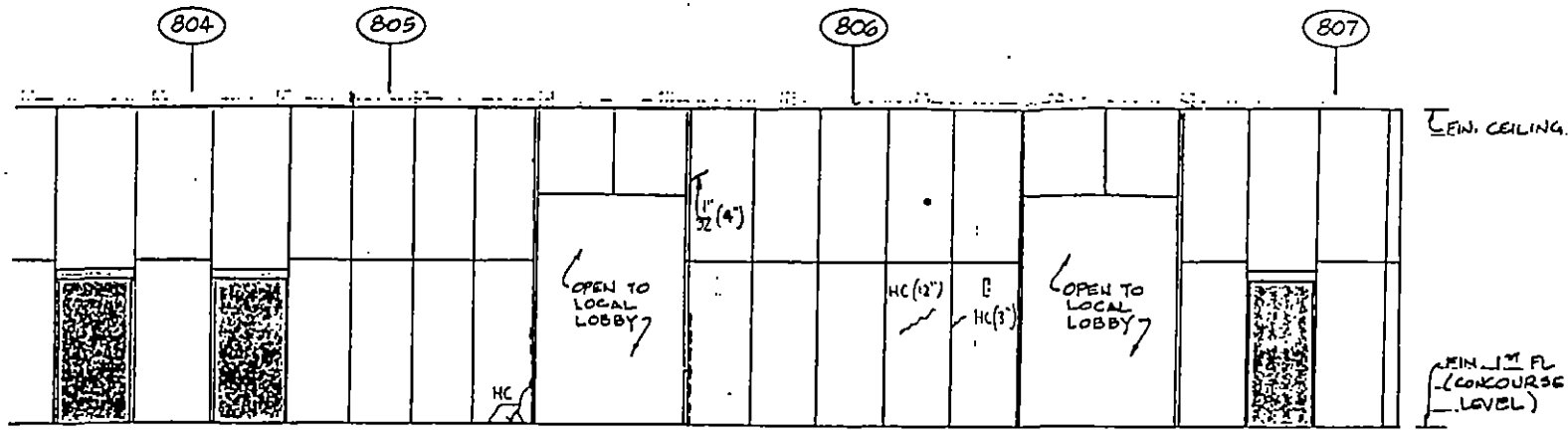
PART ELEVATION H-H (PLAZA LEVEL)

NORTH CORE WALL (COL. 504 - COL. 508)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE – PLAZA LEVEL - NORTH CORE WALL	DWG NO: SK-M22



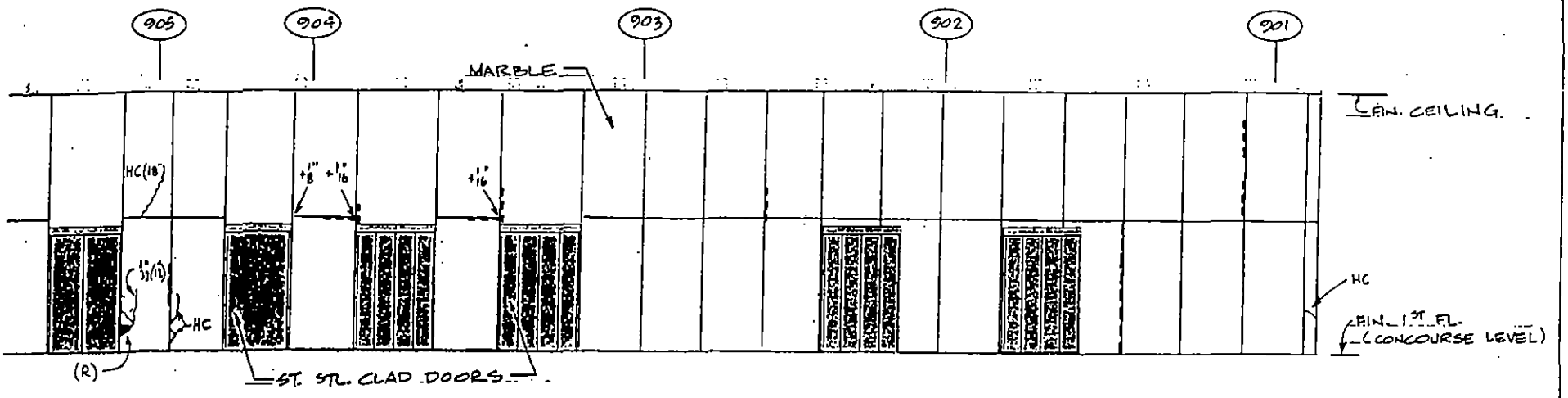
PART ELEVATION J-J (CONCOURSE LEVEL)
CORRIDOR WALL (COL. 801 – COL. 804)



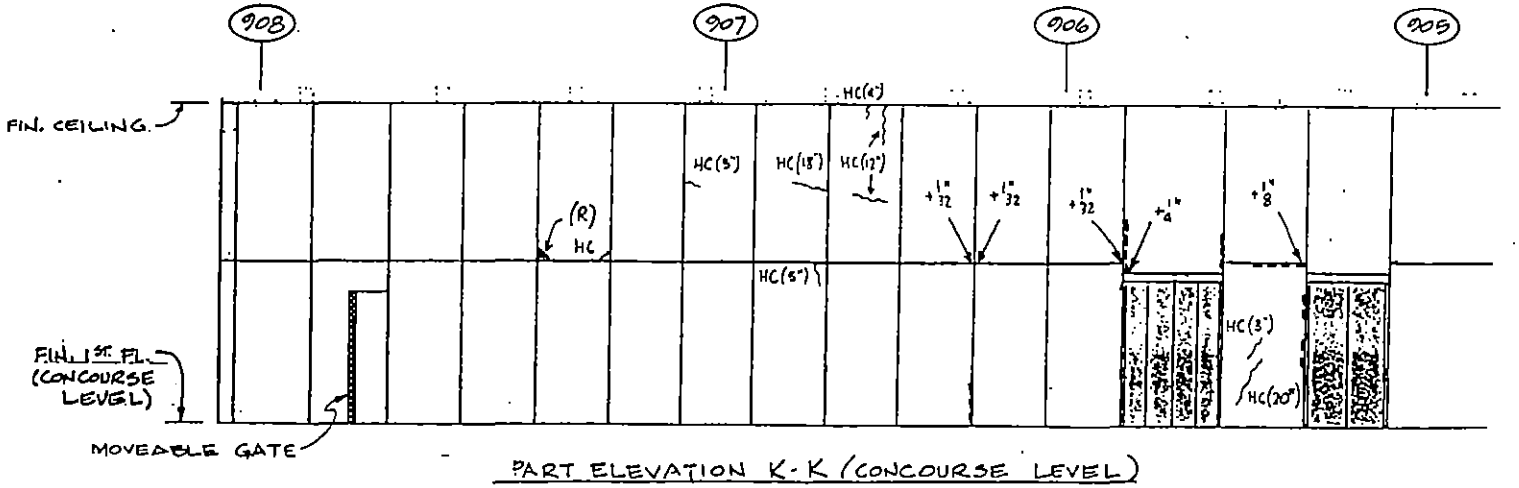
NOTES:
- HC = HAIRLINE CRACK (L) = LENGTH
- = MISSING GROUT
- +A/0 = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL
- (R) = REPAIRED CRACK

PART ELEVATION J-J (CONCOURSE LEVEL)
CORRIDOR WALL (COL. 804 – COL. 807)

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE - CONCOURSE LEVEL CORRIDOR - NORTH WALL	DWG NO: SK-M23



PART ELEVATION K-K (CONCOURSE LEVEL)
CORRIDOR WALL (COL. 901 - COL. 905)



PART ELEVATION K-K (CONCOURSE LEVEL)
CORRIDOR WALL (COL. 905 - COL. 908)

NOTES:
- HC = (HAIRLINE CRACK) (L) = LENGTH
- ! = MISSING GROUT
- +A/O = PROJECTION OF UPPER PANEL BEYOND LOWER PANEL
- (R) = REPAIRED CRACK

THE WORLD TRADE CENTER TOWER "A" CONDITION SURVEY	LOBBY MARBLE - CONCOURSE LEVEL CORRIDOR - SOUTH WALL	DWG NO: SK-M14

B. CEILINGS - TENANT AND PUBLIC AREAS

1. Description

Most of the office area ceilings in Tower A of World Trade Center are lightweight construction, weighing less than 4 lbs per square foot. The two most predominant types of ceiling are concealed spline and lay-in acoustical tiles. Almost all of the local elevator lobby ceilings are construction of gypsum board.

Heavyweight plaster ceilings are present mainly in sky lobbies on 44 and 78 floors at corridors and local elevator lobbies and Port Authority cafeteria dining areas on the 43rd and 44th floors.

The ceilings at tenant and public areas were visually inspected from the floor level for presence of any visible deteriorations and excessive deflection. An in-depth condition survey of the suspension system was conducted for plaster ceilings. Access into the ceiling was gained through existing hatches and light fixture openings in plaster and through openings made in tile ceiling adjacent to the plaster ceiling.

The results of the inspection are summarized in Tables 1, and 2. The ceiling on the 67th floor was excluded from the ceiling condition survey of Tower One due to limited access. Part of the ceiling on the 67th floor was previously inspected and found to be adequate (see Appendix 1). The inspection of the remaining portion of the 67th floor ceiling will be incorporated with any construction work on that floor.

2. Inspection Findings

a. Heavyweight Ceilings.

The inspected heavyweight ceilings were found to be in good condition.

Heavyweight ceilings were present at the following locations:

- Main Lobby - Concourse level at core corridor and under the mezzanine level.
- Main Lobby - At the 6th floor level.
- Sky lobby at 44th and 78th floors.
- Port Authority cafeteria dining area at 43rd and 44th floors.

The main lobby ceiling at 6th floor level was inspected by a consultant during November and December 1990. A report entitled "World Trade Center - 1 WTC and 2 WTC - Main Lobby Ceilings" dated February 1991 was issued under separate cover.

The gypsum plaster ceiling under the mezzanine level was visually inspected from the concourse floor. Along the south wall the ceiling exhibited one small area of peeling paint and one small area of map cracks. Adjacent to the core wall the ceiling exhibited one hairline crack approximately three feet long. The remaining portion of the ceiling under the mezzanine level and at the core corridor was found to be in good condition. No stains or cracks were observed.

The gypsum plaster ceilings on the 43rd, 44th, and 78th floors were visually inspected from the floor level and through existing hatches, light fixture openings and through openings made in the tile ceiling adjacent to the plaster ceiling. The plaster ceilings were found to be in good condition with no cracking or sagging, see Table 1. The suspension system of the plaster ceiling on the 44th and 78th floors public areas (see Photo C1) is constructed as follows:

Components:

- Hanger - 1" X 3/16" metal strap spaced up to 4'-6" on centers.
- Bridging members - 1 1/2" deep hot rolled channel spaced up to 4'-6" on centers.
- Carrying channel - 1 1/2" deep hot rolled channel spaced up to 4'-6" on centers.
- Furring channel - 1" deep hot rolled channel spaced at 1'-0" on centers.

Connections:

- Hanger to main structure - Embedded straps
  - Shot-in studs
- Hanger to embedded strap - 3/8" diameter bolt with square nut.
- Hanger to shot-in stud - Square nut
- Bridging and/or carrying channels to hanger - 3/8" diameter bolt with square nut.
- Furring channel to carrying channel - Spring wire clip
- Metal lath with plaster to furring channel - Wire loop at 6" on centers.

The suspension system of the plaster ceiling on the 43rd and 44th floors at the Port Authority cafeteria (see Photo C2) is constructed as follows:

Components:

- Hanger - 1/4" diameter steel rod spaced at 3' -4" by 6'-8"
- Carrying channel - 2" deep hot rolled channel spaced at 3'-4" on centers.
- Furring channel - 1" deep hot rolled channel spaced 1'-0" on centers.

Connections:

Hanger to main structure	-	Beam clamps
Carrying channel to hanger	-	Channel clamp
Furring channel to carrying channel	-	Spring wire clip
Metal lath with plaster to furring channel	-	Wire loop at 6" on centers

The suspension system of the plaster ceiling was not constructed in accordance with the Port Authority's design criteria, however the suspension system shows no visual signs of distress. The ceiling components and their connections have been analyzed and found to be adequate. Therefore no reinforcement and/or replacement of the hanger system is required.

TABLE 1

HEAVYWEIGHT CEILING IN DEPTH CONDITION SURVEY

Floor	Location	Plaster Clg. Area Sq. Ft.	Condition	Remarks
43	PA Cafeteria	14,000	G	
44	PA Executive Dining	5,000	G	
	Sky Lobby Main Corridor	1,600	G	
	Local Elevator Lobbies	1,200	G	
78	Sky Lobby Main Corridor	1,600	G	
	Local Elevator Lobbies	1,200	G	Near Hatch at Elevator shaft PE97 - Small water pond on top of ceiling.

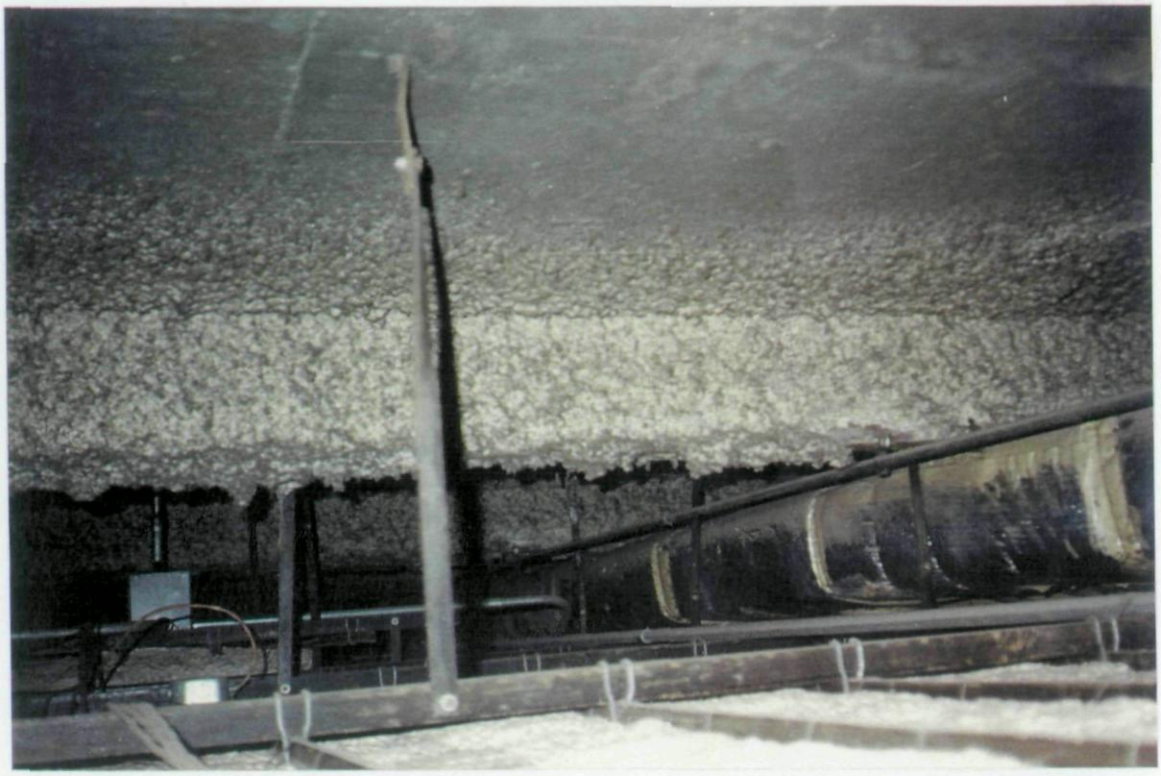


PHOTO C1 - 44TH FLOOR SKY LOBBY - MAIN CORRIDOR PLASTER CEILING SUSPENSION SYSTEM

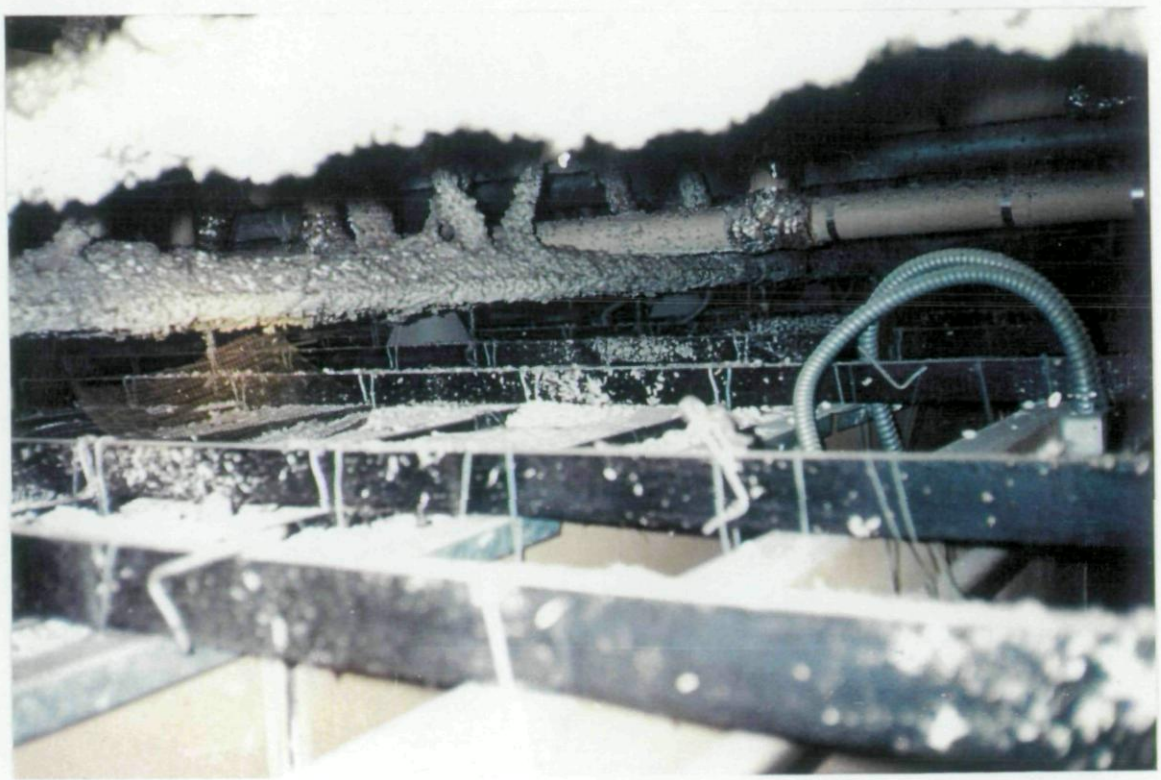


PHOTO C2 - 43RD FLOOR - P.A. CAFETERIA PLASTER CEILING SUSPENSION SYSTEM

b. Lightweight Ceilings

A walk through condition survey was conducted for the lightweight ceilings in Tower A.

Three basic types of lightweight ceiling were observed during the inspection: gypsum board, concealed spline acoustic tiles and lay in acoustic tiles. For location and condition of the different types of ceiling see Tables 2-I, 2-II, & 2-III.

Gypsum board ceiling is commonly used at the local elevator lobbies. On some floors gypsum board ceilings were also found in areas such as reception, conference and board meeting rooms.

Concealed spline acoustic tile ceiling are constructed with two sizes of tiles 12" X 12" and 20" X 20". On most floors, 12" X 12" acoustic tiles are used in the core corridors and freight elevator lobbies. The 20" X 20" acoustic tiles are used in the outer areas.

Lay in acoustic tile ceilings are generally constructed of 24" X 24" tiles. On several floors lay in ceilings were constructed of acoustic panels of varying in sizes: 24" X 36", 36" X 48", and 48" X 60".

The 107th floor restaurant lobby and gallery ceiling is made up of 1/8" thick mirrored tiles glued to 5/8" thick gypsum board. The mirrored tiles are 12" X 36" or 18" X 18".

CONCLUSIONS

The ceilings throughout Tower A are in good condition.

A walk through condition survey of the lightweight ceiling revealed no significant deterioration. Some minor deteriorations such as missing, loose or broken tiles were observed at isolated locations.

RECOMMENDATIONS

Priority

None

Routine

1. Replace missing and broken tiles.

TABLE 2 - I
LIGHTWEIGHT CEILING WALKTHROUGH CONDITION SURVEY

ZONE I

FLOOR NO.	CONDITION					REMARKS
	TYPE OF CEILING					
	CONCEALED SPLINE		LAY-IN		GYPSUM	
	12" BY 12"	20" BY 20"	24" BY 24"	OVER 24"	BOARD	
9						No access-under constr.
10						No access-under constr.
11	G	G			G	
12						No access-under constr.
13						No access-under constr.
14	G	G			G	
15	G	G			G	
16	G			G	G	
17	G	G			G	
18	G	G			G	
19	G	G			G	
20	G	G			G	
21	G	G			G	
22	G	G			G	
23						No access-under constr.
24	G	G			G	
25	G	G			G	
26	G	G			G	
27	G	G			G	
28	G	G			G	
29						No access-under constr.
30	G	G			G	
31	G	G		G	G	
32	G	G			G	
33	G	G			G	
34	G		E		G	
35	G		E		G	
36	G		E		G	
37	G	G			G	
38	G	G			G	
39	G	G			G	
40	G	G			E	

LEGEND: G - Good, E - Excellent

TABLE 2 - II
LIGHTWEIGHT CEILING WALKTHROUGH CONDITION SURVEY

ZONE II

FLOOR	CONDITION					REMARKS
	TYPE OF CEILING					
	CONCEALED SPLINE		LAY-IN		GYPSUM	
	12" BY 12"	20" BY 20"	24" BY 24"	OVER 24"	BOARD	
43	G	G			G	For plaster, see Table 2.
44	G	G			G	For plaster, see Table 2.
45	G	G			G	
46	G	G			G	
47	G	G			G	
48	G	G			G	
49	G	G			G	
50	G	G			G	
51	G	G			G	
52	G	G			G	
53	G	G	G		G	
54	G	G			G	
55	G	G		G	G	
56	G	G			G	
57	G				G	
58	G				G	
59	G				G	
60	G		G		G	
61	G			G	G	
62	G	G		G	G	
63	G			G	G	
64	G			G	G	
65	G			G	G	
66	G	G			G	
67						Not inspected.
68	G	G		G	G	
69	G			G	G	
70	G			G	G	
71	G			G	G	
72	G	G		G	G	
73	G			G	G	
74	G	G		G	G	

LEGEND: G - Good, E - Excellent

TABLE 2 - III
LIGHTWEIGHT CEILING WALKTHROUGH CONDITION SURVEY

ZONE III

FLOOR NO.	CONDITION					REMARKS
	TYPE OF CEILING					
	CONCEALED SPLINE		LAY-IN		GYPSUM	
	12" BY 12"	20" BY 20"	24" BY 24"	OVER 24"	BOARD	
77	G	G			G	
78	G	G			G	For plaster, see Table 2.
79	G	G			G	
80	G	G			G	
81	G	G	G		G	
82	G	G			G	
83	G	G			G	
84	G	G			G	
85	G	G			G	
86	G	G	G		G	
87	G	G	G	G	G	
88	G	G			G	
89	G	G	G		G	
90	G	G	G		G	
91	G	G	G		G	
92						No access - under constr.
93	G					
94	G	G			G	
95	G				G	
96	G	G			G	
97	G		G		G	
98	G	G			G	
99	G	G			G	
100	G	G			G	
101	G	G			G	
102	G	G			G	
103	G	G			G	
104	G				G	
105	G	G			G	
106	G	G	G		G	
107	G		G	G	G	Mirror tiles in gallery.

LEGEND: G - Good, E - Excellent

C. STAIRWAYS

1. Description - Structural Systems

Three stairways, referred to as Stairways A, B and C, are located in the core area. Stairways A and C start at the second floor and run up the tower to the roof. Stairway B runs the full height of the tower from the Subgrade levels to the roof. The stairs are constructed of two steel channel stringers, steel risers, and concrete-filled steel pan treads. The treads and risers are connected to the stringers with welded or bolted steel angle brackets. Each stairway structure is framed into the core framing at each floor with steel wide flange beams which are encased with concrete fireproofing.

The stairs are enclosed by gypsum board walls or by plaster and metal lath walls. Two steel handrails are provided, one mounted on the wall and one attached to the interior stringers. On most floors the stairs are constructed in two flights with an intermediate landing.

2. Inspection Findings

All three stairways were visually inspected from their lowest floor to the roof. Inspection findings are summarized in tabular form for each stairway.

No significant deficiencies were found on the structural elements of the stairways. At scattered locations, the concrete surface of the platforms, intermediate landings and stairway treads exhibited hairline cracks or small spalls. A fine crack with vertical displacement of 1/16"+ was noted along the edge of several platforms, see schedules for location, see photograph S1. On the underside of approximately 20 intermediate landings rust colored stains and small areas of light rust were observed, see photograph S2. The concrete encasement on the steel beams which frame into the core framing exhibited hairline cracks at some floors. Scattered holes of various sizes were found in the sheetrock or plaster and lath walls and soffits which enclose the stairways. Hairline cracks were noted in the sheetrock walls which enclose the stairway. The cracks, which generally extend from the corner of the door frame to the ceiling, were not found on every floor. The locations of these cracks have not been included in this report but are available in the Quality Assurance Division office. The handrails were generally securely attached. However, at random locations, handrails were loose due to loose or missing bolts.

3. Conclusions

Stairways A, B and C are in good condition. No structurally significant deficiencies were found.

4. Recommendations

Priority

None

Routine

1. Patch spalls in stairway tread and landing surfaces.
2. Re-attach loose handrails.
3. Patch holes in sheetrock or plaster walls and soffits.

PHOTO S1 - CRACK ALONG EDGE OF PLATFORM - 1/16"+ VERTICAL DISPLACEMENT

PHOTO S2 - UNDERSIDE OF IMMEDIATE LANDING
LIGHT SPOT RUST AND RUST STAINS

STAIRWAY "A" - DEFICIENCY SCHEDULE

FLOOR	HAIRLINE CRACKS IN CONCRETE				SPALLED CONC. AROUND FIRE STANDPIPE	STEEL PAN (RUST STAINS)	LOOSE HAND RAIL	HOLE IN SHEET ROCK	OTHER
	"P" SLAB	"L" SLAB	TREADS	BEAM ENCASEMENT					
3	●	●							
4		●			●	●			
5	●	●			●	●			
6		●		●	●	●			
7				●		●			
8				●	●	●			
9	●								
10	●								TOP SURFACE REPAIRED-CRACKED & RAISED 1/16"
13	●			●					
14	●			●	●				
15		●							
16	●				●				
17	●								
18	●								TOP SURFACE 2"x 48" RAISED 1/16"+
19		●							
20	●	●							
21	●			●					
22	●			●	●				
23				●					
24	●				●				
25	●								
26				●					
27	●								
28	●								
32	●				●				
33	●								CRACKED AREA (3"x 12") HOLLOW SOUNDING
34	●								
36	●				●				
38	●				●				
40	●			●	●				

● DENOTES WHERE DEFICIENCY OCCURS
"P" SLAB : PLATFORM SLAB @ FLOOR LEVEL
"L" SLAB : INTERMEDIATE LANDING SLAB

STAIRWAY "A" - DEFICIENCY SCHEDULE

FLOOR	HAIRLINE CRACKS IN CONCRETE				SPALLED CONC. AROUND FIRE STANDPIPE	STEEL PAN (RUST STAINS)	LOOSE HAND RAIL	HOLE IN SHEET ROCK	OTHER
	"P" SLAB	"L" SLAB	TREADS	BEAM ENCASEMENT					
42	●								
44			●						TREAD SURFACE SPALLED 4"x 1"x 1/8" DEEP
45	●								
46								1"x 3"	
48	●								
52					●				
53	●								
59	●								
68	●	●			●		●		
69	●			●					
70	●			●					
71		●		●					
72		●			●				
74					●				
76	●								
77	●								
78	●								
80				●			●		
82	●								
83							●		
87								2"ϕ	
94	●								
98	●								
100					●		●		
102					●		●		
104		●	●						10 TREADS-ONE HAIRLINE CRACK IN EACH TREAD
106	●						●		
108	●			●					
109				●				2"ϕ	
110				●					

● DENOTES WHERE DEFICIENCY OCCURS
"P" SLAB : PLATFORM SLAB @ FLOOR LEVEL
"L" SLAB : INTERMEDIATE LANDING SLAB

STAIRWAY "B" - DEFICIENCY SCHEDULE

FLOOR	HAIRLINE CRACKS IN CONCRETE				SPALLED CONC. AROUND FIRE STANDPIPE	STEEL PAN (RUST STAINS)	LOOSE HAND RAIL	HOLE IN SHEET ROCK	OTHER
	"P" SLAB	"L" SLAB	TREADS	BEAM ENCASEMENT					
2							●		
3	●	●	●					2"ϕ	
4		●							
6							●		
11				●					1/4" WIDE CRACK IN BEAM ENCASEMENT
13	●								
33							●		
54		●							
59				●					
70		●	●				●		TREAD SURFACE SPALLED 3"ϕ x 1/16" DEEP
75								2"ϕ	
76							●		
78								2"ϕ	
81								6" x 12"	LOOSE METAL EDGING OVER INT.LANDING
85								12"x12"	
86								12"x12"	
87								8"x12"	
92								6"ϕ	
93							●		
94									HANDRAIL- ONE BENT BALUSTER (1/2"□ VRTICAL BAR)
102									2 PIECES METAL EDGING (FOR SHEET ROCK) HANGNG LOOSE. OVER INT.LANDING
103				●				6"ϕ	
104								2"ϕ	
106		●							
108							●		

● DENOTES WHERE DEFICIENCY OCCURS
"P" SLAB : PLATFORM SLAB @ FLOOR LEVEL
"L" SLAB : INTERMEDIATE LANDING SLAB

STAIRWAY "C" - DEFICIENCY SCHEDULE

FLOOR	HAIRLINE CRACKS IN CONCRETE				SPALLED CONC. AROUND FIRE STANDPIPE	STEEL PAN (RUST STAINS)	LOOSE HAND RAIL	HOLE IN SHEET ROCK	OTHER
	"P" SLAB	"L" SLAB	TREADS	BEAM ENCASEMENT					
3						●			ONE NOSING BOWED
4					●	●		4" x 6"	
5	●					●			THREE NOSINGS BOWED
6					●	●			
8						●	●		ONE HANDRAIL SUPPORT MISSING
10	●								
12		●	●			●			
14		●				●			
16						●		4"ø	
17				●		●			
18	●			●					1/8" CRACK IN BEAM ENCASEMENT
19	●	●	●	●					
20	●					●			
21				●					
22						●			
23			●						ONE NOSING BOWED
24	●					●			TOP SURFACE ALONG CRACK RAISED 1/16"±
25	●					●			2" LONG DENT IN STRINGR BOTTOM FLANGE
26	●								
27	●								
28	●								
31	●			●					
32	●					●			TOP SURFACE ALONG CRACK RAISED 1/16"±
34	●			●					
35	●								
36	●								
37	●		●						
39	●								
40	●								
42								3ø1"o 1ø4"o	
43	●							5"ø	
45	●								
46	●								
47			●						
48	●								
49	●								

● DENOTES WHERE DEFICIENCY OCCURS
"P" SLAB : PLATFORM SLAB @ FLOOR LEVEL
"L" SLAB : INTERMEDIATE LANDING SLAB

STAIRWAY "C" - DEFICIENCY SCHEDULE

FLOOR	HAIRLINE CRACKS IN CONCRETE				SPALLED CONC. AROUND FIRE STANDPIPE	STEEL PAN (RUST STAINS)	LOOSE HAND RAIL	HOLE IN SHEET ROCK	OTHER
	"P" SLAB	"L" SLAB	TREADS	BEAM ENCASEMENT					
50	●								
51	●								●
53	●								
54	●								
56	●								
57				●					
58	●								
61	●								
62	●								
64		●			●				
66	●								
67	●								
68	●	●							
76	●								
77	●								
78	●								
79	●								
82	●								
83								4"ø	
85				●					
91				●					
93				●		●			
98									INT. LANDING - SMALL SURFACE SPALL 1 1/2" x 3" x 1/4" DEEP
102					●		●		
103				●					
104		●		●			●		
105									RUST STAINS ON STRINGER
106		●				●			
107						●			
108				●					
110	●			●					HAIRLINE CRACK IN SLAB ABOVE (UNDERSIDE OF ROOF)

● DENOTES WHERE DEFICIENCY OCCURS
"P" SLAB : PLATFORM SLAB @ FLOOR LEVEL
"L" SLAB : INTERMEDIATE LANDING SLAB